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CONTENTS

Veterinary Progress, Policies and Comment.....143-146

Disease During War, 143; Deficiency in Diet May Cause Abortions, 143; Mortality in Pneumonia Lessened by Sulfonamides, 143; Veterinary Profession Helpful in Undulant Fever Problem, 143; History of Profession Valuable, 143; Rabies Cases Reported to B. A. I., 143; Spirochetes Common in Farm Animals, 143; Substitute Rations Satisfactory for Poultry, 143; Kansas Resolutions, 144; Nebraska Resolutions; Sheep Casing for Sutures More Abundant, 144; New Director General of Canada, 144; Record Production of Anti-Hog Cholera Serum, 144; New Developments in Animal Science, 144; Pigeons of War, 145; The Nation's No. 1 Racket, 145; Biologic False Positive Wassermann Tests, 146; Crystal Violet Vaccine Promising, 146; Prevention of Hemorrhagic Septicemia in Cattle, 146; Livestock Feed Considerably Shorter in 1944, 146; Cost of Bovine Mastitis in Illinois, 146.

Cesarean Section Due to Fractured Pelvis.....147

Acetonemia, a Vitamin A Deficiency.....150

Studies of Sheep Parasites (No. 1).....154

Cattle Grubs and Their Control.....162

Immunization Against Swine Pox.....167

Veterinary Practice by Appointment.....170

A New Treatment for Scabies in a Dog.....174

Ileal Volvulus in a Horse.....176

Bovine Cussedness.....176

Incontinence in a Bitch.....177

Cryptorchid Calves.....177

Altresia Ani in a Newborn Calf.....178

Abstracts.....179-180

The Value of Meat, 179; Initiation of Lactation in Heifers by Hormone Administration, 179; Reduction of Toxicity of Sulfonamides, 180; Minimum Dose of Phenothiazine for Sheep, 180; Sulfaguanidine and Sulfathiazole for Pullorum in Turkeys, 180; Penicillin Sodium and Sulfonamides in Certain Protozoan Infections, 180.

Book Reviews.....181-182

Diseases of the Genital Organs of Domestic Animals, 181; Nutrition of the Dog, 181; Useful Bulletins, 182.

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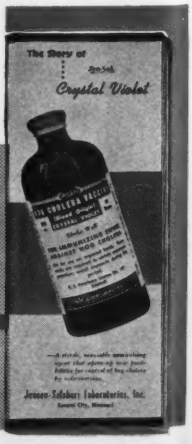

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The Russo-Japanese War (1904-5) was the first war in which disease did not kill more men than battle wounds.

In southern India where milled rice is a common staple of diet, still births and abortions (human) are three times greater than in northern India where whole wheat is generously consumed.

As a result of the use of sulfonamides during the past several years the mortality in hospitalized cases of pneumonia was reduced from 37 to 7%. The mortaility from this disease in army camps during 1943 was less than 1%.

The contributions to the undulant fever problem by the veterinary profession have been rich during recent years and are playing a predominant rôle in our (the medical) profession in the campaign against this redoubtable malady.—*Med. Times.*

To be properly grounded, the veterinary practitioner should be familiar with the history of his profession and with the origin and development of the live stock industry that it serves. A study of these will strengthen his confidence in himself. It will convince him that veterinary service is indispensable and without it present civilizations would crash.

Since 1938, about 8000 cases of rabies have been reported to the federal B.A.I. annually. In 1942, 6,300 cases in dogs, 228 in cattle, 15 in horses, 32 in sheep and 28 in man were reported.—*H. W. Schoening.*

Spirochetes occur in five diseased conditions common in farm animals—schirrus cord, bull nose and black scour in swine, thrush in horses and foot-rot in sheep. Arsenic, administered internally, has a destructive influence on spirochetes.

Normally 18% of the graduates of medical schools locate in New York state, which contains about 10% of the population of the country; one-third of 1% locate in Alabama which has 2% of the population. At present 80% of medical graduates enter the armed forces.

In investigations made at Pennsylvania State College with eight groups (totalling 125) ringnecked pheasant chicks using eight different substitute rations for the restricted dried milk products, meat scraps and fish meal; the substitute rations were found highly satisfactory. The bulk of the different substitute feeds was soybean oil, dried whey and dried brewers' yeast and the pheasants were reared to six weeks of age at which time they were sufficiently feathered for release.

Kansas Resolutions

At the annual meeting of the Kansas Veterinary Medical Association Dec. 28 the House of Representatives adopted two resolutions indicating a progressive attitude. Both were directed to the State Livestock Commissioner; one urging him to collect and publish animal vital statistics for the state and the other urging that research on anaplasmosis be undertaken.

Nebraska Resolutions

At its annual meeting Dec. 15-17, 1943, the Nebraska Veterinary Medical Association adopted two resolutions of more than local interest.

Resolution No. 1 called attention to the enormous loss sustained as a result of the depredations of the cattle grub and pledged the members of the association to support the educational plan of the National Livestock Loss Prevention Board for the control of the cattle grub, which, it is estimated, damages hides to the extent of 50 million dollars annually and depletes the supply of leather needed for the war effort and for the civilian population.

Resolution No. 2 instructed the treasurer to invest $500 from association funds ($500) in War Bonds.

Supply of Sheep Casings for Sutures Increased

The value of phenothiazine in controlling nodular worms which damage sheep casings so urgently needed for making surgical ligatures is indicated by the following report released by the Agricultural Research Administration of the U. S. Department of Agriculture. One large meat packer—based on post-mortem observations of about 1,400 lambs from treated and untreated flocks in southern Minnesota—indicate an 8-fold increase in the proportion of intestines free from damage by nodular worms. In 1942, the year before the flocks were treated, less than 10% of lamb intestines were free from nodular worm injury. In 1943, after treatment by phenothiazine to remove the parasites 80% were free from injury by the parasite.

The control measures consisted in the treatment of the sheep in the breeding flocks with phenothiazine, thereby protecting the subsequently born lambs from exposure to worm infection.

By his appointment in December, Mark Barker became Veterinary Director General of Canada—a position he has filled as acting director since the retirement of A. E. Cameron almost a year ago. Doctor Barker was a 1907 graduate of the Ontario Veterinary College and he became affiliated with the Health of Animals branch the following year and held several positions previous to his appointment as Chief Veterinary Inspector in 1939.

Record Production of Anti-Hog-Cholera Serum

Anti-hog-cholera serum is now being made in record-breaking quantities. The production figures show that more than 1,700,000,000 cubic centimeters of the protective serum were made during the period July 1, 1942, to June 30, 1943. This quantity is about 25% above last year's high output and greatly exceeds all previous production records.—*Dept. of Agri.*

Almost a hundred new developments in the progress of animal science are described in the latest annual report of the Bureau of Animal Industry which deals largely with research affecting the productivity and health of live stock and poultry in the United States.

The Bureau reports that about two million pounds phenothiazine were used last year for anthelmintic treatment and that experiments indicate that sulfaguanidine is of value for protecting chickens from cecal coccidiosis.

The serious threat of swine erysipelas, particularly in the Corn Belt, resulted in research by the Bureau for the production of an effective vaccine which last year was used in the treatment of 20,000 herds containing over 1,500,000 swine. The protection which it gave is credited with saving large numbers of hogs.

In the extensive Federal-State campaign against bovine brucellosis, the Bureau prepared and distributed enough diagnostic antigen for more than seven million tests.

Pigeons of War

For 2,000 years pigeons have been helping men fight wars. At first thought pigeons might seem obsolete, but even in these highly mechanized days, wireless equipment fails to function, radios become silent. When that happens there is only one hope

Courtesy Our Dumb Animals

Carrier pigeon takes off with a message giving the position of the two U. S. Navy balloonists shown here

for stranded men whether in foxholes, lost in jungles, or floating in the ocean—the homing pigeon, that swift, modern Mercury who has been known to fly over 500 miles in a single day. In this war the United States alone is using 900,000 homing pigeons. The English have 750,000.

Out from Greenland in the cold North Sea one wintry night, six British airmen clung to a part of a wrecked plane. As the plunging bomber headed for the water the radio went dead and the probabilities of rescue seemed remote. Finally some one thought of the pigeons still in their metal container. A message was hastily scribbled and attached to the capsule on one bird's leg and he was tossed into the air. In spite of oil-soaked wings he spiralled up into the gray sky and was off like a shot into the winter twilight. Exactly 45 minutes later the bell rang in a pigeoneer loft on the northern shore of England. Hastily the caretaker removed the capsule from the pigeon's leg, and immediately an SOS went to shore patrols. Thus due to a war pigeon and his wonderful homing instinct, six British airmen's lives were saved. Every merchant ship and every patrol plane carries a basket of homers.

Because of their wondrous efficiency both in England and the United States, warnings are out not to shoot pigeons during this war as they may be homers carrying vital war messages.—*Hollands.*

* * * *

Black Market Meat: The Nation's No. 1 Racket

Under the above head and with the subhead "A Flourishing Evil That May Endanger the Nation's Health," Thomas C. Desmond, chairman of the New York joint committee on nutrition, advances about the most forceful reasons, that have yet been given by anyone, for state meat inspection —an inspection that would reach that portion of the nation's meat supply which is not processed in federally inspected plants.

The opening paragraph states:

"The gory hand of the black marketeer stretches across the whole country, grabbing meat intended for fighting men and diverting it to greedy civilians willing to pay bootleg prices. It slaughters livestock in filthy barns with dirty equipment and ships the carcasses to unscrupulous butchers at sky-high prices."

Specific instances are given of the slaughter of diseased animals. A veterinarian is quoted as saying: "There is a buyer working out of my city who makes a business of buying cattle just before they die of mastitis, traumatic gastritis and other diseases." Another tells of a herd of hogs, many of them dying of hog cholera, that were sold to black market, slaughtered and put on the market for human consumption.

The author continues:

"Today tons of tainted meat are being loaded on the trays of butcher shops from Oregon to California to be purchased by unsuspecting consumers. The meat comes from thousands of slaughterhouses which are in a deplorable condition." Only Cali-

fornia has set up a meat inspection system to prevent such abuses. At least 25 million animals will be slaughtered this year without proper inspection.

The author recommends that laws be enacted requiring that slaughter houses be licensed, inspected and kept clean. State laws and local ordinances should require all meat that is sold should be first examined by competent inspectors both before and after it is slaughtered.

★ ★ ★ BUY WAR ★ ★ ★
STAMPS AND BONDS

Biologic False Positive Wassermann Tests

Army experience has shown, conclusively, that the ordinary precipitation and complement fixation tests for syphilis become positive, in at least 15%, during one to several weeks after vaccinations (with takes) against small pox as well as in a great variety of acute febrile diseases, although the individuals having positive reactions were *not* syphilitic.

Crystal Violet Vaccine Promising

Experimental tests continue to indicate the effectiveness of crystal violet vaccine and the certain advantages it has over the virus-serum treatment in immunizing hogs against hog cholera. The vaccine, developed by Department of Agriculture scientists, has been tested on thousands of hogs at the Bureau of Animal Industry's Experiment Station, Ames, Iowa, and on nearby Corn Belt farms. Limited experiments have also been carried on in England. One of the chief advantages of the vaccine is the absence of systemic reaction which frequently accompanies the use of the virus-serum treatment. Other advantages are that crystal violet vaccine is not capable of causing disease or contributing to the spread of cholera, nor, apparently, does it cause a loss of appetite or consequent interruption in growth. The principal disadvantages are slowness in development of immunity and the possibility that immunity is not so lasting as that produced by serum and virus. Use of the vaccine is not practicable where cholera is already present or on pigs farrowed on premises where the principal feed is garbage.—U. S. Dept of Agri.

Veterinary College for Illinois

The Illinois Veterinary Medical Association has revived the dormant project of establishing a college of veterinary medicine at the state university. The board of trustees of the university has assured the association that it will give careful consideration to its recommendation.

Livestock feed, really short in 1943, will be 18% shorter in 1944, according to *Trends*, weekly letter of The Continental Bank & Trust Co.

A practical means of preventing tuberculosis from becoming troublesome in poultry flocks is the disposal of old hens. As the disease generally develops slowly, an affected fowl seldom becomes a menace to others in the flock until about 16 months of age or thereabouts. Then a hen has finished her first laying year and if she has been fed properly should be in good condition for slaughter. If the flock is replenished with pullets raised from clean stock, the premises will be constantly restocked with disease-free birds. The sale of hens will pay a considerable part of the cost of raising the pullets, and the owner avoids having to carry the hens through the non-productive, molting season of late summer and early fall.

Cost of Bovine Mastitis in Illinois

In Illinois there are approximately 1,100,000 dairy cows with an average annual production of 5,020 pounds of milk—a total of 5½ billion pounds. It is conservatively estimated that 25% (245,000) of the dairy cows are affected with chronic mastitis. Mastitis is believed to be responsible for a reduction of about 20% in the milk production. On this basis, the annual loss of milk in Illinois from this cause would approximate 276 million pounds which represents the equivalent of the average production of 55,000 cows. Not only is the loss of milk of economic importance but, in addition to this, mastitis shortens the life of the lactating animal and reduces the quality of the milk as well as lowering its fat content.—*Dept. Animal Pathology and Hygiene, University of Illinois.*

Cesarean Section Due to Fractured Pelvis

By CHRISTIAN G. JENSEN, Capt. V.C.

THE history of this mongrel, shepherd type bitch, insofar as it concerns her afflictions which necessitated cesarean section, is of interest.

She was owned by the personnel of a WAC Co., and was the pet of all the soldiers of that company. One day "Lady" went out on the road and, being inexperienced, stopped in front of a jeep and greeted it by wagging her tail. But, the jeep didn't have time to play, ignored her, and she was picked up later by some members of the WAC company and brought to the Station Veterinary Dispensary.

Fluoroscope and Xray examinations revealed an interior luxation of the left coxofemoral articulation, a fracture through the acetabulum, a fracture in the shaft of the ilium and separation and distortion of the symphysis pubia and, to complicate the picture, a pregnancy of about 40 days' duration.

Repairs and reduction of the fractures were attempted with fair results; however the healing processes were slow, due to the added burden of pregnancy. At the termination of the gestation period it became imperative to perform a cesarean section. My assistants were Lt. Paul White, V.C., and Cpl. Wm. Taylor (anesthetist).

The illustrations indicate the main steps in this operation:

Lt. White (above) was watching resuscitation of the puppies at the moment the photograph was taken

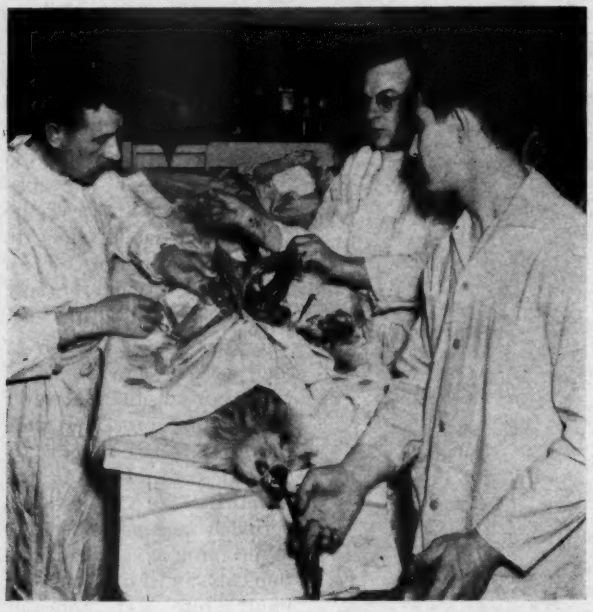


Fig. 1 shows both gravid uterine horns lifted out of the abdominal cavity through an incision in the abdominal wall (linea alba) sufficiently large to prevent bruising or injury to the uterus and the puppies.

Fig. 2 shows the gravid uterine horns well packed off with moist, sterile, turkish toweling and the incision through the uterine wall being made. Due to an occlusion at the bifurcation of the horns it was necessary to make an incision in both.

Fig. 3 shows the removal of the pups and the placenta from the uterus. Six healthy viable pups was the harvest.

Fig. 4 shows the body and horns of the uterus after the pups were removed. From this point on a complete ovariohysterectomy was performed, to prevent future pregnancies. The puppies were given to another nursing bitch.

Fig. 5 shows suturing of uterine stump well below the bifurcation and careful ligation of all blood vessels.

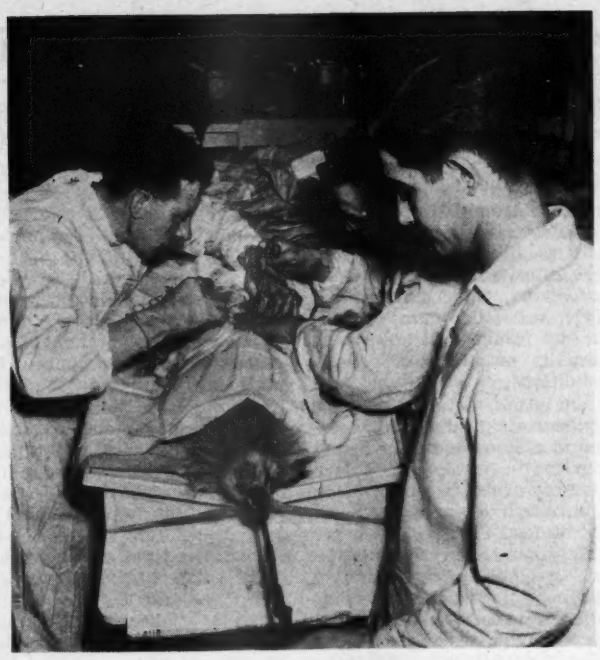
Fig. 6 shows the suturing of the incision in the abdominal wall completed.

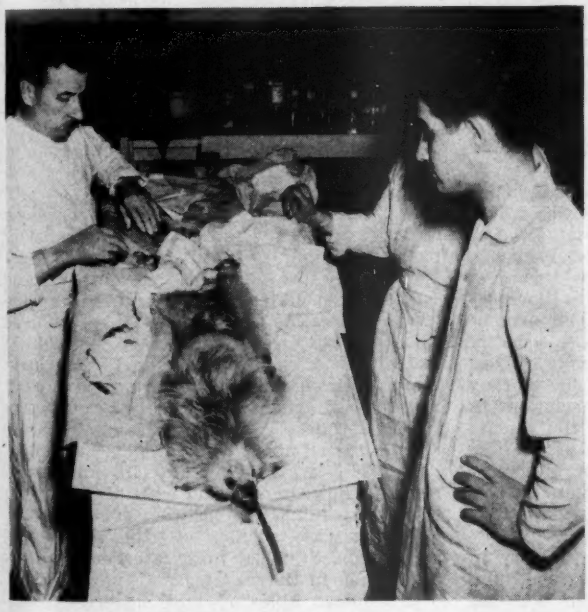
Four layers of sutures were used in closing the abdominal wall:

1. A simple over and over continuous suture (No. 1 chromic catgut double-strand) in the peritoneum and posterior or inner fascial sheath.

2. Interrupted sutures (No. 1 chromic catgut single-strand) in anterior or ventral fascial sheath. Substantial bites of fascia should be taken, being careful not to include musculature as the sutures cut through muscle tissue very quickly leaving them loose and giving a false sense of security.

3. Continuous suture (No. O chromic catgut single-strand) in the subcutaneous fascia. This will bring the skin margins close together but care should be taken not to place the suture too close to the edge





of the skin.

4. Interrupted sutures (dermis medium fine) in the skin, sufficiently close together to prevent gaping.

The skin sutures were all removed by the seventh day and an uneventful recovery took place. Healing and repairs of the luxation and fractures of the pelvis took place rapidly after the bitch had been delivered of the pups. A month later one would not have suspected that she had ever connected with a fast traveling jeep.

It may be of interest to note that anesthesia was maintained by the auto-inhalation method developed by Hardenbergh and Mann of the Institute for Medical Research, Mayo Foundation, Rochester, Minnesota. Ether is used by the auto-inhalation method after induction in an ether cabinet. This has proved to be a very safe and satisfactory method. Perfect surgical anesthesia can be had for hany hours with only intermittent attention by the anesthetist. Post-operative pulmonary complications occur less frequently than with other forms of ether inhalation.

Acetonemia, a Vitamin A Deficiency

By JOHN W. PATTON
East Lansing, Michigan

IN EXPLANATION of the above head, let it be understood that it does not mean that *all* acetonemia is solely vitamin deficiency but—well read the discussion.

By acetonemia in this discussion is meant that condition manifesting clinical symptoms which veterinarians usually call by that name. It is known also as ketosis, acetonuria, ketonuria, palsy after calving, catarrhal enteritis and, less frequently, still other names. Probably it is seldom the primary factor in the ailment, being usually an effect of one or more of many conditions.

Acetonemia is an unsatisfactory name for this disease entity, since it means simply acetone in the blood and acetone or ketone bodies may be present in the blood and urine as a result of a wide variety of causes—milk fever, metritis, starvation, febrile disturbances, even an abrupt change of feed and various other conditions. For convenience, in this discussion, "acetonemia" is employed to designate the clinical condition exhibiting the symptoms enumerated herein. "Ketosis" is used to indicate the condition in which there is low blood sugar and a high concentration of ketone bodies in the blood and urine but no clinical symptoms. This classification is of course purely arbitrary. In the north-central part of the country the cases of ketosis under this classification outnumber the cases of acetonemia probably a hundred to one; in the southern and southwestern states the clinical and the sub-clinical cases are possibly about equal.

This report is preliminary only. It is hoped to make a more detailed report later including blood and urine studies, daily observation of cases treated and a more complete evaluation of the part played by feed in the disease. A preliminary report is made at this time because of the enormous economic importance of the disease and the belief that a better therapy than that commonly employed has been developed and further that this therapy suggests a practical means of prevention. In view of the great prevalence of the disease and consequent large loss in milk production, any successful measures to ameliorate or prevent the disease are highly important at this time, as a contribution to increased food production.

Acetonemia has had a peculiar history in America. It was described in Europe soon after the turn of the century but was not recognized in this country until Udall pointed out that a condition described in 1933 as "Palsy after Calving" by J. T. Alston,* Tupelo, Miss., was what European veterinarians called acetonemia. Now that the condition has become better understood, it is seen that it was reported several years earlier as chronic milk fever, relapsing milk fever, cottonseed poisoning etc. The condition has existed probably as long as cattle have been fed in America, but the prevalence has probably increased directly as greater milk production has been attained by selective breeding.

The clinical symptoms of acetonemia in the southeastern states where it is most prevalent and most acute are: Suppressed or greatly impaired appetite, suspended rumination, greatly reduced milk production, constipation, unsteady gait, particularly in the hind limbs, a characteristic sweetish odor of the breath and rapid loss of flesh. Other symptoms common but not universal are: A wild, staring appearance of the eyes, impaired vision (sometimes total blindness) arched or swayed back, spine kinked to one side (so-called S curve), holding the head high, muscular tremors, pica, salivation, grinding the teeth (in cases complicated by metritis), paralysis of the hindquarters, diarrhea (rare and of short duration), convulsions (rare), total suppression of the milk flow (rare) and "downers" (in old very thin cows and usually not associated with lactation. Such animals seldom recover and there seems to be some question as to complications). In all cases showing clinical symptoms the reaction to the Ross test is strongly positive. Usually 1cc of the solution first tested when diluted with 4cc of water again gave a 4-plus reaction.

It is obvious to any one who has discussed acetonemia with veterinarians from various parts of the country that it (the clinical form) is far more prevalent in the southern and southwestern states than it is in the north-central states. As a preliminary to a study of this condition, a trip was made through 15 states. The disease was discussed with veterinarians throughout this territory and cases were visited whenever there was an opportunity to do so. Briefly the general picture unfolded itself about as follows:

In Michigan, Indiana and Illinois, acetonemia is not common and when seen is more often than not a complication of some other obvious disease, such as metritis, eversion of the uterus, dystocia, milk fever etc. Ketosis is common in these states.

In central Missouri and eastern Kansas acetonemia is seen more frequently but seldom in animals on green pasture. It occurs principally in lactating cows (second to sixth week inclusive) that are fed poor quality hay.

In Oklahoma acetonemia is far more preva-

lent than in any other state visited up to that time. The experience of Drs. E. W. Meads and F. D. Retliff is typical for that territory. Doctor Meads has practiced at Claremore 30 years, and his associate, Doctor Retliff, a shorter period. They see upwards of 150 cases a year—25 to 40 a month during January, February and March, some three or four cases a month when the cattle are on green pasture, about 10 cases per month during July, August and part of September, when the grass is completely dried up but few cases after the fall rains come. They see a few cases in range Herefords on pasture, usually about one or two months before the cows are due to calve.

Only occasionally do they see acetonemia in commercial dairy herds. The great majority of cases occur in small farm herds. In that section the larger dairy herds are well fed, receiving commercial dairy feeds for concentrates and prairie hay for roughage. The farm herds are fed cottonseed meal, cottonseed hulls and the same kind of hay. The doctors attribute the comparative immunity from acetonemia, experienced in these dairy herds, to the better feed that the animals receive and the prevalence of the disease in farm herds to the unbalanced ration on which most of them are maintained.

As a treatment, Doctors Meade and Retliff rely upon intravenous injections of dextrose (1000cc of 50% solution) and a change of concentrate to corn chop and syrup or a good "sweet feed" as commercial dairy feed is commonly called throughout the South. Mortality is practically nil in treated animals.

At College Station, Texas, the disease is seen only occasionally in the large college herd, which is fed a balanced concentrate ration, silage, and good alfalfa and grass hay. But about 100 cases yearly are brought in to the clinic from the surrounding country and a larger number are seen "in the field." In this section farm cows are fed cottonseed meal, cottonseed hulls and prairie hay or allowed to run on stubble and weeds which are dry in the wintertime. As elsewhere, few cases are seen when the cows are on green pasture.

Treatment was in the main dextrose, intravenously. A smaller number was given chloral hydrate and all received a change of feed and the addition of molasses to the diet. Dextrose is preferred to chloral hydrate. Mortality was practically nil except in old, thin cows that were down and unable to rise before they were treated. Most of these succumb.

In Louisiana the prevalence of acetonemia is probably about the same as in East Texas and the conditions under which it occurs are similar. The dextrose treatment prevails.

In Florida no veterinarians doing a large dairy practice were contacted. Acetonemia occurs in that state but whether or not it is prevalent was not ascertained.

In Mississippi, Alabama, Georgia, and southern Tennessee the conditions are much alike. Not a few veterinarians in these states asserted that the treatment of acetonemia constituted 70 to 80% of their winter practice. The majority of the cases occur during the first three months of the year. The disease is comparatively rare in animals on good pasture. The cows are in the main good grade Jerseys—some high-grade and pure-bred cows among them. Chloral hydrate and a rumen stimulant is the medication commonly used. A lesser number of veterinarians use dextrose. The winter feed of most of these cows in these states is cottonseed meal, cottonseed hulls and peanut vine hay or other poorly cured low quality innutritious grass hay. Calling the peanut vines hay is a euphemism. It is a combination of roots and stems leached for weeks and containing no leaves or other parts that appear edible. However, it can't be as abominable as it looks for cattle eat it readily. A good many of the cows run at large and browse somewhat upon coarse dry weeds and are able to pick up a small amount of green stuff along water courses and highways. The foregoing applies particularly to farmers who produce their own cattle feed. Commercial dairies purchase their feed and insist upon it being of good quality. Family cows about the villages, in some instances, are fed locally produced feed while others, particularly in and about larger cities, have commercial feeds purchased for them. Acetonemia is not common in the large commercial dairies but it is very prevalent in the farm cows. If either the concentrate or the forage is replaced by a better balanced feed the incidence of the disease is lowered. Replacing the concentrate is more effective than changing the roughage. Substituting good feed for both renders the problem of acetonemia a minor one.

Evaluating, at this point, our observations, the reports of practitioners and the rather voluminous literature on acetonemia and allied conditions we find:

1. Acetonemia (clinical) occurs in all parts of the country, at all seasons and in cows of all breeds. It occurs, occasionally, in range cattle at younger ages.

2. In the northern half of the country acetonemia is uncommon and, when it occurs, is frequently a complication of some other ailment. In the southern and southwestern states it is exceedingly prevalent as a primary ailment in the winter months and in midsummer when the pastures have dried up. Ketosis (non-clinical) is common in the North and apparently less so in the South.

3. The greatest incidence in any group oc-

*Alston, J. T. Palsy after Calving. *Vet. Med.* 28:4, pp. 159-160.

curs in good to high producing, lactating cows at the period of maximum milk production and maintained on the most inadequate diet, i.e., in animals putting out the most and taking in the least. In the same districts the disease is far less prevalent among cows of the same type, that receive a better-balanced ration.

4. In all sections the prevalence of acetonemia drops materially when green grass in quantity is available to the animals. In driving through the Cotton Belt in winter, cattle may be seen along the highways everywhere striving to pick up a little green grass and indicating an extraordinary craving for such feed.

5. It is obvious that the prevalence of acetonemia as a primary ailment is directly proportional to the lack of vitamin A in the feed and the need for this factor by the animal. Furthermore, the symptoms of primary clinical acetonemia closely parallel those of vitamin A deficiency, and cottonseed meal, which has long been notorious for its association with cottonseed meal poisoning (which is really vitamin A deficiency), is always associated with the highest incidence of primary clinical acetonemia.

It was decided to try vitamin A therapy in acetonemia and a district at the junction of Alabama, Mississippi and Tennessee was selected as being typical for the areas of highest prevalence.

Three veterinarians with large dairy practices are located in and near this area—Drs. J. T. Alston and Clayton Stevens at Tupelo and Dr. W. L. Stroup at Corinth. Doctor Alston has practiced at Tupelo, Miss., for more than 30 years and his associate, Doctor Stevens, for six years. They treat upwards of 1000 cases of acetonemia yearly, seeing about one-third of them and dispensing for the remainder, the diagnosis of the latter being made from the description of the symptoms given them by the owners of the animals. It is their belief that drug stores in Tupelo also dispense treatment for many animals. As everywhere else, the greatest number of cases is among animals on dry feed which, except in commercial dairies, is almost exclusively cottonseed meal, cottonseed hulls and peanut vine "hay" or low grade native grass hay.

The treatment is six drams of chloral hydrate daily for four days with a change to "sweet feed" (commercial dairy ration). The mortality is practically nil in treated cases and the doctors are called upon to treat only about 5% of relapses. The loss in milk production is naturally considerable.

Dr. W. L. Stroup has practiced at Corinth, Miss., for more than 30 years. His practice is a little more than half in Mississippi, nearly two-fifths in Tennessee and the remainder in Alabama. The feed is the same as that given above for the Tupelo area. He treats 300 to 400 cases of acetonemia yearly; a large majority of them occurring from January to April inclusive. He sees all the cases he treats except where the distance or the press of more urgent calls makes it impractical.

Doctor Stroup's treatment is generally one ounce of chloral hydrate daily for four days and 30 grains of barium chloride and 30 grains of tartar emetic daily for the same period. The owner is advised to change the ration to "sweet feed." It is his impression that relapses are under 10%. Mortality in treated cases is low but in untreated cases high, according to Doctor Stroup. He is not favorable generally to the addition of molasses to the ration but advises it in some cases.

An outstanding dairy of 90 purebred and high-brade Jersey cows has been operated at Corinth for many years. Doctor Stroup has never treated a case of acetonemia in this herd and the owner states no case of the disease has ever been recognized in it. This herd is fed in accordance with the best scientific knowledge available.

It was arranged with Doctor Stroup to treat alternate cases with vitamins, the remainder to be given his regular treatment. In pursuance with this plan three uncomplicated cases were given vitamin B_1, four uncomplicated cases were given vitamin A, one case, complicated by metritis, was given vitamin A and two cases that had received the chloral hydrate treatment one to four weeks earlier but had not fully recovered, were given vitamin A. Because the amount of concentrated vitamin A available in Corinth was less than five million units, an effort was made to make it go as far as possible with the result that the doses given, in several instances, were probably too small for optimum effects. Doses of 100,000, 200,000 and 250,000 units were given on each of three successive days. It is believed the larger dose should be used. Although in the uncomplicated cases, treated with vitamin A, the clinical symptoms disappeared completely within 24 hours, ketone bodies in the urine disappeared more gradually, as indicated by the Ross test usually falling in the first 24 hours from 4+ in a 1 to 7 dilution to 4+ with undiluted urine and to 1+ to 3+ at the end of 48 hours. At the 72nd hour the reading was from a trace to 2+. Even after three days a trace reaction remained in 50% of the cases. Observation had to be discontinued before it was determined how long this trace reaction would last or how soon ketosis would again be present if the feed were not changed. However, it seems certain that the condition will recur if a better balanced ration be not supplied.

As already stated it is hoped to report the results of this investigation in detail later. At this time, the cases treated with vitamins will be summarized only.

Cases O4, O6 and TE7, all typical and un-

complicated, each were given a single hypodermic injection of 100,000 units of thiamine. While the animals were relaxed somewhat the effect on the acetonemia, if any, was imperceptible and they were then given the chloral hydrate and followed the usual course.

Cases M16, T10, T11 and T13, typical uncomplicated, were given 100,000 to 250,000 units of vitamin A *per os* and made spectacular recoveries from the clinical symptoms within 24 hours with marked dimunition of the ketone bodies in the urine. The administration of this vitamin was continued on the second and third days to enable the animals to build up a small reserve of vitamin A. The feed was not changed—a better ration would, of course, be supplied later.

Case M19 developed a severe case of acetonemia when her calf was eight days of age and was given the chloral-hydrate—rumen-stimulant treatment. She improved markedly but didn't quite recover. Ten days later she developed another attack and was treated again. She improved a second time but was still ailing five days later. The reaction to the Ross test was 4+ in a 1 to 7 dilution, and her breath had the characteristic sweetish odor of acetonemia. There was a marked vaginal discharge and other evidences of low grade metritis. She was given two doses (100,000 units) of vitamin A and, although she improved so far as the nervousness was concerned, she was still moping, had little appetite and little milk secretion. On the third day she was given 10cc of diethylstilbesterol. The following day there was great improvement; 250,000 units of vitamin A was given and on the fifth day the animal ate and acted like a well cow. It is doubted that without the diethylstilbesterol that the animal would have shown any improvement after that produced by the first dose of vitamin A, however much of the vitamin had been given. This animal had received a fair ration since a month before calving.

Two uncomplicated cases treated a month earlier by the older method but still eating poorly, acting depressed and giving little milk, recovered as spectacularly as cases M16, T10, T11 and T13.

Concentrated vitamin A was used—capsules the size of a pea containing 50,000 units. Two to five of these were placed on a No. 10 capsule and given with a balling gun.

What is really important is the difference in the response to the chloral hydrate treatment and to the vitamin A treatment. With the chloral hydrate the animals live, the distressing clinical symptoms are relieved in 24 to 48 hours and the appetite gradually improves. In a week or so after treatment the animals become more active. It is just as if the chloral hydrate slowed them up until the metabolism can be adjusted to bring the output of vitamin A in line with intake. Metabolism then continues on a lowered plane; one that can be supported by the unbalanced ration which, in most instances, the cow is put on again, as soon as a sack of "sweet feed" is used up.

When given vitamin A, within 24 hours it is just as if the slate had been wiped clean. The cow looks and acts like a different animal. The therapy scores a bull's eye. The cow has obtained what she lacked.

Summary

1. Acetonemia occurs in all parts of the country. It is of enormous economic importance (mainly because of reduced milk production) in the Cotton Belt.

2. The incidence of acetonemia among milk cows corresponds closely to the deficiency of vitamin A in the feed and to the requirement (as developed by milk production) of the animal for it. The symptoms too are approximately those of acute uncomplicated vitamin A deficiency.

3. Acetonemia responds promptly and recovers completely when given vitamin A. The treatment is logical and superior to any other commonly used and should supplant other therapy. The cost of sufficient vitamin A for a treatment is merely nominal.

Addendum

Although the matter was not studied it was rather obvious on a 6000-mile trip that there is materially more calf scours and mastitis in the acetonemia area than one would expect in that climate and with the care given both calves and cows. The apparent high susceptibility to these ailments is suggestive of widespread vitamin A deficiency.

Pregnancy disease of ewes was not studied but it was noted on the same feeds on which acetonemia occurred in cows and, therefore, is suggestive.

The use of cottonseed meal as the sole concentrate for dairy cows is uneconomic and wasteful as well as harmful to the animals. It constitutes a large excess of proteins which produces an imbalance of the ration and at the same time wastes protein badly needed in other parts of the country to balance rations lacking in proteins.

It may be repeated that vitamin A is not recommended nor suggested as a treatment for any of the ailments of which acetonemia is often a complication. In acetonemia as a complication of milk fever or metritis, for example, the administration of vitamin A may help by relieving the actonemia but it will not lessen in any degree the necessity for treating the animal for milk fever or metritis or any other ailment from which it may be suffering. Vitamin A in the medicine case is not a substitute for gray matter in the cranium.

Studies of Sheep Parasites

I. The Course of Untreated Nematode Infections*

By Philip A. Hawkins, C. L. Cole, E. E. Kline and J. H. Drudge
East Lansing, Michigan

THE course of untreated nematode infections in sheep is not only of interest to the parasitologist in elucidating host-parasite relations, but to the veterinarian and animal husbandryman in formulating plans for control and treatment. During the past year a group of ewes and lambs of mixed breeding was maintained under the same conditions and their reactions to naturally-acquired infections were studied.

Careful work of this type was first carried out by Stoll[1] (1929), in a study of the acquisition of natural resistance (self-cure) to the common stomach worm, *Haemonchus contortus*. This work was extremely valuable in the laying of a groundwork for further investigations along this line, but it dealt with only one parasite. Schmid[2] (1933), demonstrated that the numbers of stomach worm eggs passed by lambs increased from May to September, while the numbers passed by yearlings and ewes decreased during the same period. Taylor[3] (1935), in a study of the trichostrongylid eggs passed by ewes, found a peak was reached in June, with very few eggs being passed during November, December, January and February. In this latter work, no attempt was made to separate the eggs of the different species. Marsh[4] (1936), in a study, primarily of the brown stomach worm, *Ostertagia* sp., found a peak in egg production was reached about the first of August in both lambs and yearlings, after which there was a decline in egg production until the termination of the experiment in December. Andrews[5] (1939), showed that lambs acquire a resistance against superinfection with *Cooperia curticei* as evidenced by the production of small nodules about the larvae in the intestinal mucosa. Andrews[6] (1942), in a study of pure stomach worm, *H. contortus*, infections in lambs demonstrated that the pathological alterations of the blood follow closely the course of the infection; i.e., a drop in the red blood cells and hemoglobin is associated with the acquisition of stomach worms. A rise in these blood constituents follows the spontaneous loss of most of the worms through an acquired immunity.

Natural untreated nematode infections have also been studied in other animals. In these studies it has been conclusively demonstrated that acquired immunity is the natural course of events in many roundworm infections, and not the exception. This would indicate that if the animal possesses an innate protective mechanism, intensive animal husbandry practices may have led to the breaking down of the host's defense mechanism and turned the parasites into killers. Therefore, in order that our control measures may supplement the protective reactions of the host rather than break them down, it is of utmost importance that we possess an adequate knowledge of the reactions of the host to untreated infections.

The purpose of this paper is to record the normal course of nematode infections in untreated ewes and lambs under natural conditions of flock management. It has been possible to record the course of infection of each nematode with which these animals have become infected and the effects of these parasitisms on the host.

Methods

Fifty ewes were used in this study. These are a part of the flock maintained at this station and consisted of a random selection of pure-bred and cross-bred stock. These animals were kept together as a unit from November, 1942, when they were brought into the barn, through the pasture season of 1943 until their return to the barns the following November. During this time they received no medication of any sort, with the exception of dipping. Fecal examinations were made at intervals on 10 members of this group; representative ewes of each type

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were selected at random and served as the source of material for fecal examinations during the rest of the experiment. Blood examinations were not started until May 15, 1943, after which they were made on four ewes at weekly intervals during the summer.

The lambs were born during March, 1943, from the above-described ewes. They remained in the barns for nearly two months, at which time they were turned out to pasture. In the barn the lambs had free access to water, salt, bonemeal and hay; grain was creep fed. The amount of hay consumed was small. Fecal examinations were made on seven lambs at one- to two-week intervals from August to October, 1943. Prior to July 27 these examinations were made on a random sample of untreated animals. The selection of lambs to remain on pasture with the untreated ewes was random, except in a few instances where animals were necessarily removed to maintain the breeding flock. No lambs in this group received any medication.

Fecal examinations were made from material taken directly from the rectum. When obtained during the warmer months the specimen bottles were placed on ice until they reached the laboratory. If egg counts could be made within a few days after collection, four grams of feces was weighed out into a Stoll flask and diluted to 60cc with distilled water. These flasks were then placed in an electric refrigerator at 32 to 33° F. until counted. If the samples could not be examined within a few days after collection, they were stored in the refrigerator at 32 to 33° F. for periods up to two weeks—occasionally three weeks. For examination 1cc of the comminuted feces, in the case of light infections, or 0.15cc in heavy infections, was placed in a 15cc centrifuge tube with a ground top. This was filled with a saturated solution of sodium chloride and a square cover glass placed on top of the tube so that only a small bubble remained. The tube was then centrifuged for one minute at 1000 RPM, the cover glass removed, placed on a slide, and the eggs differentiated and counted. The descriptions of Shorb[7] (1939), and Kates and Shorb[8] (1943), were used in the identification of the eggs. It was necessary at first to obtain eggs from living female worms to check our diagnoses. This procedure was also employed during the course of the investigations to maintain the accuracy of the counts.

Four-gram samples of feces were used in making the dilution counts instead of the 10 grams recommended by Stoll[9] (1930), because of difficulty in consistently obtaining this larger amount. The examination of single pellets as advocated by Shorb,[10] *et al* (1939) did not prove satisfactory in pastured animals due to differences in the consistency of the feces.

Blood examinations were made from blood drawn from the jugular vein and collected in tubes containing potassium oxalate. Red and white cell counts and hemoglobin determinations were made on the day that the blood was collected. Hemoglobin determinations were made by the Sanford and Sheard photelometric method. Differential blood counts were made by counting 100 cells in a film prepared from unoxalated blood and stained with Wright's stain.

The lambs were weighed at two-week intervals after June 29, 1943.

Results and Discussion

The ewes, when moved from pasture into the barn in November, 1942, had an average egg count of 400 per gram of feces. This

TABLE I.—LEVELS OF INFECTION

Group	Eggs per Gram
1. Lambs	2200
2. Ewes	750
3. Ewes	400
4. Ewes	120
5. Ewes	60

indicated a level of infection which would not result in any clinical manifestations. This level of infection is of interest when contrasted with other groups of similar numbers, which were being studied at this time, but are not included in this report. The levels in four other groups and the group under study (No. 3) when brought into the barn is given in Table 1.

The ewes were brought into the barn with a low level of infection after the 1942 pasture season during which very severe losses from parasites had been sustained in the lambs, and some loss among the ewes. At the time it was believed that a low level of infection was partially due to the anthelmintics which the animals received during the summer and fall. However, it will be shown that this was probably not the case.

During the winter there was only a very small number of worms present in the ewes as shown by the egg counts in Charts 1 to 5. In the winter months temperatures are such that no infective stages of the parasites developed, and, therefore, those brought into the barn by the ewes must either be passed out of the body, thus producing parasite free animals, or remain in the ewes throughout the winter, producing carriers which are capable of infecting the spring lambs. Of the 10 ewes in the group of 50 checked by fecal examinations, one had rid herself of all nematodes (with the exception of *Strongyloides*) by the end of February, two had rid themselves of the common stomach worm, *H. contortus*, and four of the brown stomach worm, *Ostertagia*. In all other animals examined a residual infection was carried over from November to April. The first weather suitable for the production of infective larvae

TABLE II.—WEATHER CONDITIONS DURING EXPERIMENT*

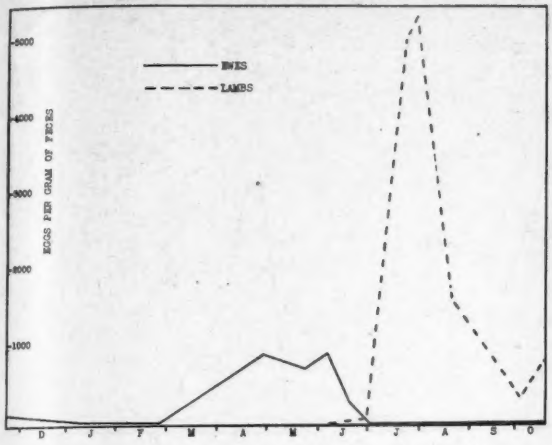
Month	Temperature ° F.			Precipitation		
	Minimum	Maximum	Mean	Snowfall	Total inches	Departure from normal
November	14	65	47.1	6.0	3.45	0.97
December	—1	43	28.5	13.0	3.06	0.99
January	—10	40	26.3	33.6	2.99	-1.17
February	—2	56	34.0	8.1	1.43	—0.47
March	—7	78	41.2	7.0	3.02	0.67
April	19	72	51.4	5.2	2.81	0.23
May	27	76	63.3	0.0	7.98	4.56
June	41	90	79.0	0.0	3.85	0.34
July	46	87	80.7	0.0	3.87	0.77
August	47	87	77.9	0.0	2.68	—0.14
September	33	86	67.5	0.0	3.45	0.54
October	32	77	57.1	1.7	1.80	—0.67

*Data from U. S. Weather Bureau about two miles from the experimental animals.

TABLE III.—WEEKLY COUNT OF NEMATODE EGGS

Species	Eggs per Gram of Feces			
	June 5	July 1	July 8	July 23
Nematodirus sp.	1	1	0	1
Trichostrongylus sp.	0	0	0	13
Cooperia curticei	0	18	16	370
Ostertagia sp.	0	0	0	80
Haemonchus contortus	1	37	33	5000
Oesophagostonum columbianum	0	0	1	100
Chabertia ovina	5	7	9	80
Total eggs per gram	8	63	59	5644

CHART I.—*Haemonchus contortus*



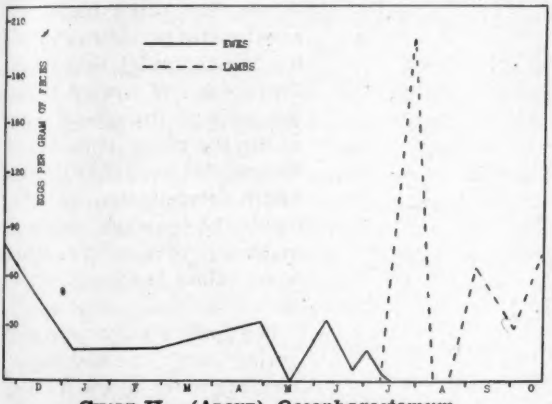


CHART II.—(ABOVE) *Oesophagostomum*

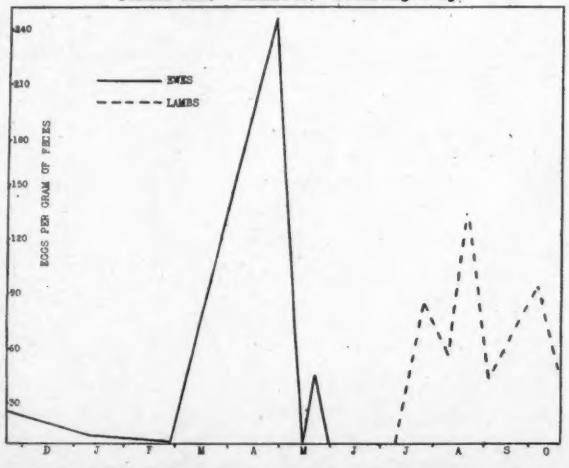
in any numbers occurred during the last few days of March. For a summary of the weather conditions during the period of the study see Table II.

Following the onset of warmer weather and the consequent development of infective larvae from eggs produced by the residual infection maintained in the ewes over the winter, a rapid increase in egg counts was noted. The counts in most instances increased very rapidly to a peak, remained stationary for about one month and then declined rapidly.

In comparing egg counts of different worms it should be borne in mind that the egg-producing capacities of the various species of round-worms found in sheep vary tremendously. Although the exact egg laying capacities of the various female worms are not known, it is known that the common stomach worm, *H. contortus*, is by far the most prolific egg layer of any of those under consideration. The infection which resulted in this rise in egg counts took place while the ewes were still in the barn. After the animals had been on pasture for slightly over a month, i.e., from May 20 to July 1, the animals had acquired sufficient resistance to eliminate spontaneously most of their parasites. This increased degree of resistance may represent a strengthening of an already existing immunity due to a renewed infection, or antigenic stimulation. These results may be seen graphically in Charts I to V. This low level of parasitism with practically no change was maintained in all animals until the experiment was terminated in October, 1943.

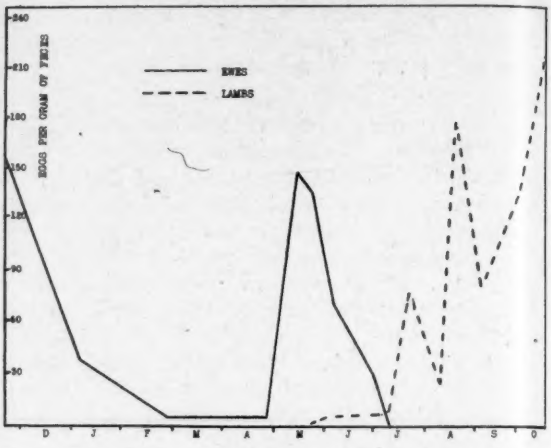
The blood picture of these ewes

CHART III.—(BELOW) *Ostertagia* sp



was studied during a part of the time the study was in progress. Unfortunately, studies on the blood were not started until May 15 when the peak of parasitism had been passed and the acquired resistance had resulted in the elimination of all but a residual infection. It is of interest to note that although there was a decline in hemoglobin from the middle of July to the middle of August; the level of parasitism at this time was extremely low. From this time to the termination of the experiment there was a gradual rise in hemoglobin values. The white blood cell count varied considerably during the course of this study. There was a downward trend, but most of the counts were within the upper limits of the normal range. The hemoglobin determination in relation to the egg count are given in Chart VI and the other blood values in Charts VII to X.

CHART IV.—*Chabertia ovina*



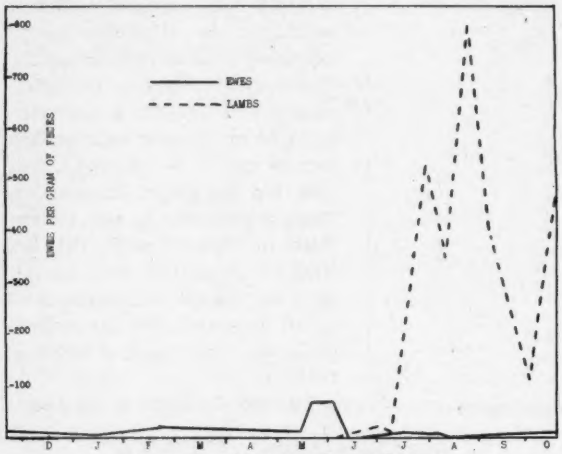
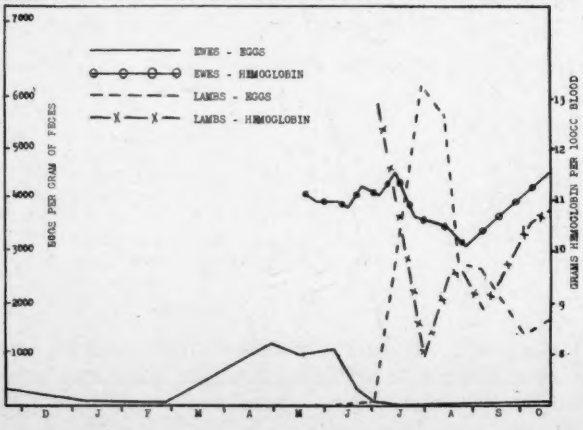


CHART V.—(ABOVE) *Cooperia* sp

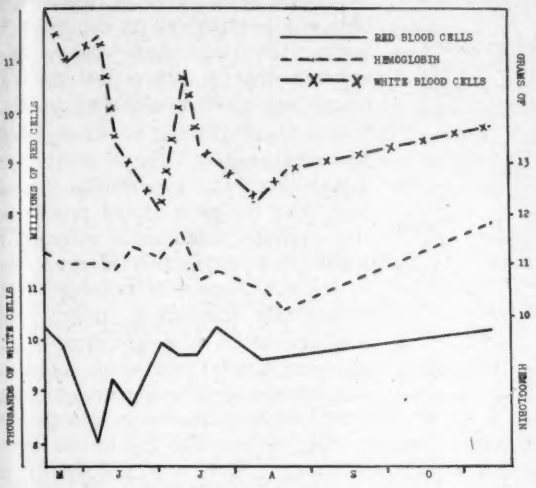
CHART VI.—(BELOW) TOTAL EGG COUNTS AND HEMOGLOBINS


EWES - EGGS
EWES - HEMOGLOBIN
LAMBS - EGGS
LAMBS - HEMOGLOBIN
EGGS PER GRAM OF FECES
GRAMS HEMOGLOBIN PER 100CC BLOOD
D J F M A M J J A S O

The lambs studied were born during March, the first nematode egg noted in the feces of these lambs, with the exception of *Strongyloides papillosus*, was *Cooperia curticei* which was seen on April 28. Only one *Cooperia* egg was seen at this time, and no other eggs were noted until June 5. The egg counts from June 5 to July 23 when weekly egg counts were started are given in Table III.

Although there is a lapse of continuity from July 8 to July 23, during which time it was not possible to make counts, it is probable that the lambs received their heavy infecting dose of larvae during the last week of June. This is based on our knowledge of the life

CHART VII.—HEMOGLOBINS AND CELL COUNTS OF EWES



cycles of these parasites.

The point of interest in these data is that although the lambs had been exposed to infection for four months, they did not become heavily infected until about July 1. This was associated with the weaning time of lambs in this area, which occurs during the month of July. It is not until this time that the lambs are consuming enough contaminated feed to become heavily infected. The ewes are the source of infection. As already noted the greater part of the peak of egg production in the ewes was passed in the barn, yet the lambs did not become infected. This was because the small quantity of feed they consumed was not exposed to gross contamination, i.e., the grain was creep fed, and the hay in racks. After the ewes were turned out to pasture on May 20 the egg counts of all species of nematodes declined to a negligible quantity, but it was after this that the lambs became heavily infected. The eggs of the various nematodes were passed in the feces of the ewes, hatched and produced infective larvae, and by July 1 had accumulated to such an extent that they presented the lambs with the opportunity of massive infection. The infection resulting from these combinations of factors, i.e., change in feeding habits of the lambs, and accumulation of infective larvae on pas-

CHART VIII.—HEMOGLOBINS AND CELL COUNT OF LAMBS

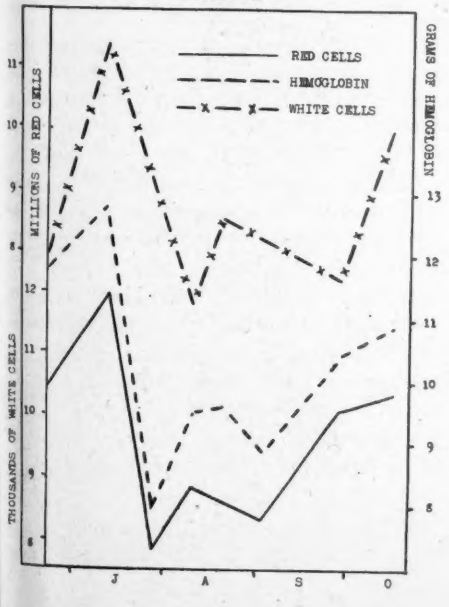


CHART IX.—DIFFERENTIAL BLOOD COUNTS OF EWES

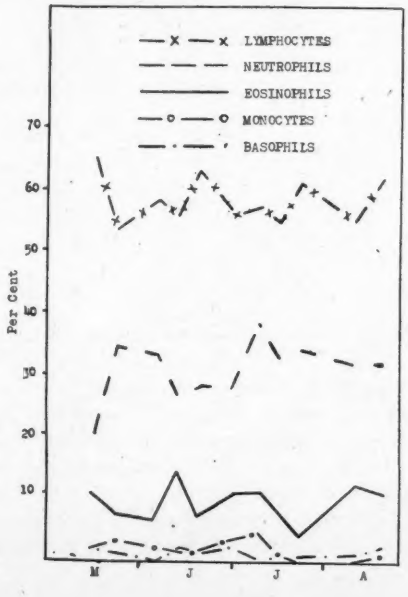
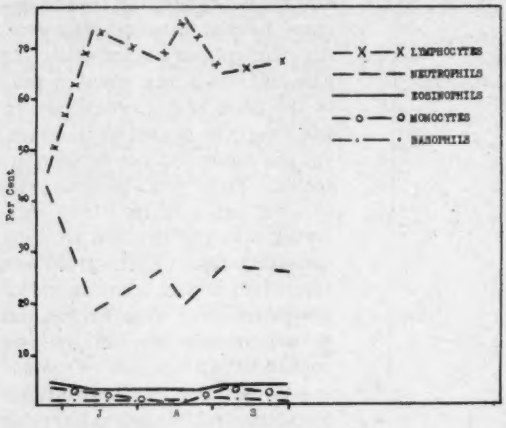
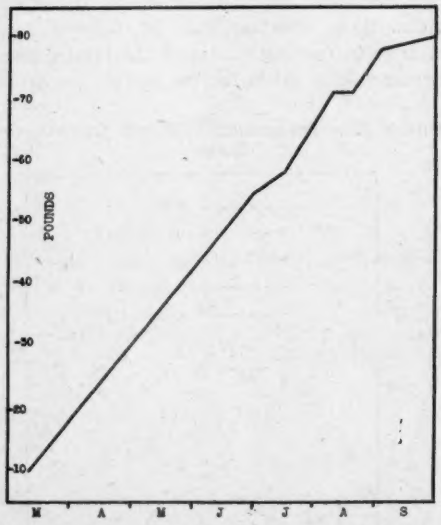


CHART X.—DIFFERENTIAL BLOOD COUNTS OF LAMBS



ture, resulted in the production of the clinical manifestations of parasitism. Egg counts and hemoglobin determinations on the lambs and ewes showing this relationship may be seen in Chart VI.

CHART XI.—WEIGHT OF LAMBS



The peak of egg production in the lambs was reached on July 27 for *Haemonchus contortus* (5400) and *Oesophagostomum* sp. (200), on August 19 for *Cooperia curticei* (825) and *Ostertagia* sp. (135). A definite peak in egg production was not reached in the case of *Chabertia ovina*, and the lambs were not heavily enough infected with *Nematodirus* or *Trichostrongylus* to note any peak in egg production. Following the peak there was a very rapid decline in egg count. The egg counts are given in Charts I to V.

The blood picture of these lambs was studied from June 25 to the termination of the experiment. Associated with the peak of egg production the average hemoglobin dropped to 8.0gm. From July 27 to the conclusion of the experiment on October 15 the hemoglobin climbed to 10.9mg; this was associated with the drop in the egg counts, particularly of the stomach worm, *Haemonchus contortus*. The red blood cell count was directly correlated with the rise and fall in the hemoglobin values. There was apparently no correlation between the degree of parasitism attained by the lambs in this study and the white cell counts. Associated with the infection in the lambs there was a decrease in the neutrophils and an increase in the percentage of lymphocytes. The eosinophiles in the lambs was approximately one-half the number found in the ewes.

The weights of the lambs during the course of this study are given in Chart XI.

Summary

1. The course of naturally acquired untreated nematode infections in ewes and lambs is recorded with the accompanying egg counts, hemoglobins, red and white cell counts and differential blood counts.

2. During the winter months the parasite burden of the ewes dropped to a negligible quantity. In a few individuals complete eradication occurred.

3. The ewes did not pick up any infection until the first warm weather in the spring.

4. The ewes underwent self cure in the late spring after passing through a relatively low grade infection.

5. The ewes maintained a very low level of infection for the remainder of the summer and fall pasture season.

6. The lambs did not become heavily infected until three or four months of age.

Clinical manifestations followed infection by three or four weeks.

7. The lambs reached a peak in egg counts very rapidly; this was followed by a rapid decline. This rise and fall in egg counts was accompanied by inverse changes in hemoglobin and red blood cell determinations, and by the appearance and partial disappearance of clinical symptoms.

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Cattle Grubs and Their Control

By BENJAMIN SCHWARTZ*
Washington, D. C.

IT IS well known to livestock producers, tanners, dairymen, butchers, and others concerned with the cattle industry, that cattle grubs—the larvae of heel flies—also known as ox warbles and "wolves," are among the most injurious pests of bovines. Various estimates have been made from time to time as to the financial losses sustained in this country from the ravages of these pests, the minimum figure given in the 1942 Yearbook of Agriculture being $50,000,000 annually. Precise information on the actual losses from cattle grubs is difficult to obtain, except in the case of those that result from the trimming of affected parts in meat packing establishments and the loss or partial loss of the thickest portion of the hide in which holes or lesser injuries have been produced by the activities of the grubs. The loss of condition in cattle resulting from annoyance by the flies, the injuries resulting from the penetration of the grubs into the skin and their subsequent migration within the body, and the effects of these parasites on beef and milk production, are too imperfectly known to warrant more than a rough estimate of the damage they entail. That these and the other injuries are considerable, however, is evident from the fact that several foreign countries that do not enjoy the economy of abundance in livestock production to which we are accustomed in normal times, have adopted and enforced over a period of years rather rigid measures for holding these pests in check, if not eradicating them altogether. Although sporadic efforts have been made here and there in this country to effect control or eradication of cattle grubs in some areas, no sustained effort has been made to get rid of these pests on a significant scale.

In normal times the control of livestock maladies and pests—except those that are of special national concern because of their transmissibility to man or other important reason—is left largely to the initiative of farmers and stockmen. Depending on whether the owners of livestock are alert or indifferent, they take precautions to protect their animals from the ravages of diseases and parasites, or let nature take her course, accepting their losses with concern or with the fatalistic attitude that such things are more or less inevitable hazards in livestock operations. In times of great national emergency, however, when the nation's vital industries are harnessed to the war effort, and geared to produce at top speed to meet goals that have been set, waste and inefficiency in production become the concern of everybody. Considering the importance of animal foods and by-products in a war economy, the losses produced by grubs acquire a significance beyond the monetary losses sustained by the industries concerned. In these critical times livestock producers must exert every effort to avoid losses of the kinds mentioned through preventive and remedial measures already available as a result of investigations conducted over a period of years, for the most part with funds from the public treasury.

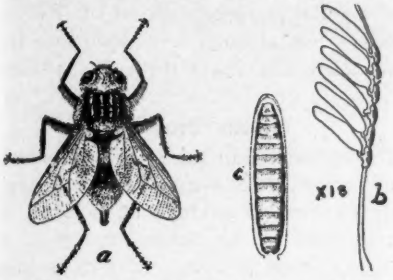
Life History of Heel Flies

There are two species of heel flies, the common species (*Hypoderma lineatum*) occurring in all States, and the northern heel fly (*Hypoderma bovis*) occuring only in the Northern States. In the life history of these flies there are four principal stages as follows: (1) the egg, (2) the larva or grub, (3) the pupa and (4) the adult fly. The first two stages are parasitic, the pupa and adult being free-living.

The eggs of the common heel fly are deposited in the first sunny days of spring. In the extreme southern part of the United States the flies begin to emerge on warm days during the winter, their emergence becoming progressively delayed as one goes northward, and taking place as late as June along the Canadian border. Several eggs in a row are attached to a single hair of the heels, rather close to the skin, or to

*Bureau of Animal Industry, Agricultural Research Administration, United States Department of Agriculture.

the hairs elsewhere on the body when the animal happens to be lying down. The northern heel fly deposits its eggs—even in cloudy days—on the hairs of the lower and upper legs, one egg being attached to a single hair. In any event, the eggs incubate



a, Warble fly (heel fly) *Hypoderma lineatum;* b, eggs of this fly attached to a hair; c, larva before it hatches and begins its travels through the body of the animal

and hatch at the site of attachment in the course of 3 or 4 days, and the newly hatched maggots or grubs move down the hair to the skin and penetrate it. The young grubs work their way upward between the muscles and a few months later they are present in the abdominal and thoracic cavities. They continue their migrations during the following months, burrowing along the surface of the paunch, intestine, spleen and other organs. At times, the common grub occurs in rather large numbers in the wall of the esophagus. In the fall and winter the grubs migrate to the back and finally come to lie under the skin. In the course of their journey some grubs get into the spinal canal and set up inflammation along the spinal cord. The grubs that reach the backs of cattle under the skin cut holes through to the surface. This permits the entrance of air that has now become necessary to the parasites' continued existence, and later affords an avenue for their escape from the host. In the back, the grub molts and gradually become isolated from the host's tissue by the formation of a cyst around it. Following a second molt, about 25 days after the first one, the color of the larva gradually darkens, the skin opening becomes enlarged, the grub—now an inch long by one-third inch thick—finally working its way out through the opening and falling to the ground. In the case of the common grub, the sojourn underneath the skin of the back lasts from 35 to 89 days whereas that of the northern grub lasts from 50 to about 100 days.

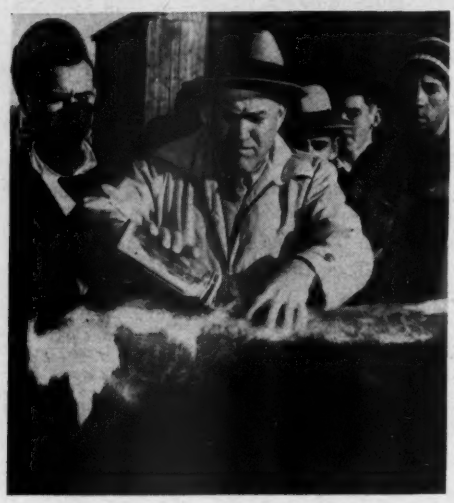
Once on the ground the grub crawls into loose earth or seeks the protection of any other available debris; the northern grub is capable also of burrowing into the soil to a depth of about one-half inch where it pupates. The seeking of protection is preparatory to actual pupation, which consists at first in the hardening of the grub's outer skin to form a protective case. Inside this case the transformation of the grub to the heel fly takes place, the rate of the metamorphosis being conditioned by temperature and, in the case of the common grub, lasting from 18 to 77 days but from 15 to 25 days in the northern grub.

Within about one-half hour after the fly has escaped from the pupal case it is ready to mate, and egg laying may commence as early as about 20 minutes or so after mating.

It is evident from the account just given that the larval development of the cattle grubs is slow and prolonged; the span of life of the adult fly is very short, however, lasting only a week or so, the sole function of the fly being reproduction. In fact, of the entire life cycle, which takes about a year, nine months or more are taken up by the parasitic development of the grub in cattle.

Although the essential facts in the life history of heel flies can be stated in a few minutes, the research effort that led to their discovery involved the combined labors of numerous investigators working in different parts of the world, each contributing one or more bits of information at a time. Some of the observations made by the early investigators were confirmed by later research, whereas other observations proved to be erroneous. Although there can be but little doubt that parasites as large as cattle grubs, forming conspicuous lumps along the backs of their hosts, have been observed by cattlemen from time immemorial, it was not until the early years of the eighteenth century that scientific observations on them began to be recorded. Many of the early observations were made by naturalists, vet-

erinarians and zoologists. The detailed work on the life history and the organization and intergration of the scattered information that had accumulated over many decades was the result of systematic investigations made by professional entomologists and parasitologists, much of this research having been done by workers in the Federal Bureau of Entomology and Plant Quarantine.



A demonstration for the National Live Stock Loss Prevention Board of a rapid method of treating animals for grubs. Derris powder is sprinkled on back of cow and rubbed in with fingers so as to reach the grubs

The observations made by Curtice in the Federal Bureau of Animal Industry in 1890 are of special importance from both scientific and historical standpoints. Curtice reported finding the grubs in the wall of the esophagus, in the pleura near the 11th rib, in the subcutaneous tissue of the back and in subcutaneous tumors, each of which had an opening through the skin. Curtice postulated, moreover, that the eggs or the newly-hatched larvae were taken into the mouth by the cattle licking their skin, and he assumed that this hypothesis would readily account for the grubs getting into the wall of the esophagus first and, by later migration, through the back into a position under the skin. This hypothesis was accepted for a long time by many competent authorities, but proved to be erroneous in the final analysis. As a result of investigations conducted in Europe and later confirmed in Canada and the United States, it has been definitely established that the newly-hatched grubs penetrate the skin and that their subsequent occurrence in the gullet and elsewhere in the body results, as has already been discussed, from their active migrations through the tissues.

Injuries Produced

The unraveling of the rather complicated and bizarre life history of cattle grubs—a truly remarkable triumph of biological research—has placed these insects in the category of perpetrators of serious injury to the host that they invade. Although the adult fly does not bite or sting, it produces great fear in, and annoyance to cattle. Such disturbances are believed to curtail milk production; to interfere seriously with proper finishing of steers for market; and to result in injuries from the frantic attempts of cattle to escape from the flies. The penetration of the newly hatched grubs into the skin results in a flow of serum that mats the hair around the injured area and, at times, causes the loss of hair, the lesions produced resembling a scaby condition. That the penetration of the grubs into the skin produces marked irritation is evident from the fact that affected cattle lick their heels and other areas where the maggots enter, and stamp and kick their feet. The migration of the spiny grubs through the various tissues and organs, as previously outlined, must certainly produce more or less irritation, and their sojourn in the back is known to produce swelling and tenderness accompanied with pus formation.

The loss of meat resulting from trimming to remove affected parts has been estimated at various times to amount on the average to two pounds per carcass. Moreover, the parts adjacent to those that have been trimmed are rather unattractive and, hence, regarded as inferior in quality. Some estimates place the devaluation of loins and ribs that have been trimmed because of grub infestation as amounting to two cents per pound. According to an article appearing in the June, 1942, issue of the *Coastal*

Cattleman, 11,500,000 pounds of beef were lost in 1941 because of grub infestation. This figure is based on the actual findings in about 35% of the 16,500,000 cattle and calves slaughtered under Federal inspection. Meat losses of the kinds mentioned are significant and costly at all times and are doubly significant now when the rationing of meat must be resorted to because supplies for the domestic market are below the demand.

Courtesy Nat'l Live Stock Producer
Applying derris wash by hand in a chute. However, the cattle may be sprayed at a pressure of 250 pounds which forces cube or derris mixtures into each grub hole. With proper equipment cattle can be treated as fast as they can be put through

The loss of leather, perhaps of greatest importance at this time because of increased needs in connection with the war effort and apparent difficulties of securing supplies from abroad, is the best known damage that results from cattle grubs. The losses arise from holes produced by the grubs and the scar tissue resulting from the repair of these injuries. Unfortunately, the holes appear along the backs, the part of the hide from which the thickest leather is cut. It is important to remember that shoe soles for soldiers, scabbards, belts for machines, harness and other important leather articles are made from the thickest part of the hide.

Various estimates have been made as regards the proportion of grubby cattle hides bought in the United States—hides being classed as grubby when they have five or more holes. It has been estimated recently that 35% of all domestic hides are classed as grubby and that the loss from this alone amounts to about $2,500,000 a year. Considering the fact that the hide constitutes approximately 7% of the live weight and about 11% of the value of the average steer, this figure is quite conservative.

Control and Eradication Measures

In view of the facts that a single female heel fly is capable of depositing about 500 eggs, that the eggs incubate in a sheltered situation on the hosts' hair coat where they escape environmental hazards, for the most part, and that the newly hatched grubs have but a short distance to traverse to penetrate the skin, it becomes obvious that unless effective and persistent efforts are made by cattlemen to cut a link in the chain that constitutes the life cycle of heel flies, there is no hope of reducing the ravages produced by the grubs. From the account of the life history that already has been given, it is quite evident that the stage in the life of the fly that can be most readily reached and destroyed is the grub in the sack that communicates with the outside through an opening in the skin.

The methods that have been advocated and practiced with considerable success in various places for the destruction of cattle grubs, fall into two main categories, namely, (1) mechanical extraction and (2) destruction by chemicals. Regardless of the method adopted for the destruction of grubs, it must be carried out thoroughly and systematically, not once a season but about every 30 days during the entire grub season in the fall, winter, and early spring, depending upon the locality. Haphazard extraction of grubs or occasional treatment with chemicals will not accomplish much in the way of effective results and, hence, will make but a slight dent on the heel fly population that starts the vicious cycle.

Extraction of grubs under governmental regulation has been practiced in a number of European countries for many years with very good results. The grubs can be removed by hand with or without the aid of forceps. Although objections of various kinds have

been made to hand extraction, experience has shown that persons who are sufficiently patient and persistent acquire skill in procedure and become remarkably adept in squeezing the grubs out of the cysts without injuring the host or crushing the grubs while squeezing them out. Crushing the grubs in the sacks may produce a severe anaphylactic reaction. Skillful operators can remove as many as 125 grubs per hour from cattle which offer no serious difficulties to the extraction process. In general, extraction by hand is more adaptable to dairy and relatively small beef herds than to large herds and cattle on the range. For them, chemical treatment is more practical.

Of the medicaments that have been advocated from time to time for the destruction of grubs in the backs of cattle, those containing rotenone — principally derris powder and cube powder—are the most effective. Rotenone-containing substances may be applied in the form of a spray, dust, or wash. The spraying method is especially useful in treatment of range cattle and must be applied with a power sprayer capable of developing about 250 pounds of pressure. The Federal Bureau of Entomology and Plant Quarantine recommends the following mixture for use as a spray: derris powder or cube powder (5% rotenone content) 5 pounds; wettable sulphur, 10 pounds; water, 100 gallons. The mixture so made up is adequate for treating about 200 head of cattle. Powders containing (1) one part by weight of derris or cube (5% rotenone content) and 3 parts of Tripoli earth (200-mesh fineness), or (2) one part by weight of derris or cube (5% rotenone content) and 4 parts of pyrophyllite (325-mesh fineness) may be dusted from a shaker can on the backs of cattle with one hand and worked into the hair with the other hand. An average application of 2 to 3 ounces of the mixed powder is sufficient for a single treatment. A wash made up by adding 12 ounces of derris powder or cube powder (4 to 5% rotenone content) and two to four ounces of neutral soap to each gallon of water, is a reliable treatment when applied with a sponge, cloth, or brush. According to the Federal Bureau of Entomology and Plant Quarantine six ounces of wettable sulphur may be substituted for the soap in the above formula. A more convenient way to apply the wash is with a home-made sprinkler which consists of a fruit jar with holes punched in the metal lid. As the liquid

Position of Cattle Grub Beneath the Skin

flows from the jar it is spread with a stiff, fiber scrub brush onto the haircoat and skin of the back and upper sides of the animal. At the present time the wash is not recommended for destroying the grubs because it requires considerable labor and too much of the insecticide per animal.

Since rotenone-containing powders are among the critical materials at this time, and may not be available, therefore, in sufficient amounts to meet the demand, the Federal Bureau of Entomology and Plant Quarantine recommends an alternative treatment, namely, the injection of benzol into each grub hole with a small oil can.

To secure effective results, grub destruction campaigns should be organized on an area basis and wherever possible on a county-wide or State-wide basis. It is essential that all cattle owners in the areas selected for such campaigns participate to the fullest extent. A few non-cooperators can largely nullify the good that is accomplished by the labors of many.

It is true that past experience has shown that cattle owners do not, as a general rule, practice cattle grub eradication voluntarily. In certain European countries farmers and stockmen have been obliged to resort to grub-eradication practices to comply with livestock sanitary regulations. American farmers and stockmen now face the challenge of doing voluntarily that which livestock producers in some foreign countries must do under compulsion. Livestock sanitary officials of this country as well as our livestock producers should accept this challenge in the interest of the war effort.—*Presented to the 46th Annual United States Live Stock Sanitary Association.*

Immunization Against Swine Pox

By H. C. SMITH, E. E. HARNDEN, O. S. WILLHAM and C. S. HOBBS
Stillwater, Oklahoma*

SWINE pox is becoming of serious economic importance in Oklahoma. During the past two years severe outbreaks were experienced in both of the college herds, and also in herds from which specimens were brought to the Veterinary Science Department for diagnosis. In 1941 the death rate in one of the college herds exceeded 25% in affected animals up to six months of age, in spite of all sanitary control measures, including isolation and dipping. In 1943 a vaccination program against swine pox, using swine pox virus, was undertaken. The plan was to vaccinate all the non-immune swine against hog cholera, using the simultaneous method; then to wait at least three weeks before starting the pox vaccination. In a few cases exceptions were made. This, it was hoped, would eliminate the two viruses becoming antagonistic. Approximately one-half the herd was to be vaccinated for pox, the remainder was to serve as controls. One-half of each litter was to be vaccinated. For example, if a sow had a litter of seven pigs, two males and two females would be vaccinated. The other three would be left unvaccinated for controls. The youngest pigs vaccinated were 26 days of age, the oldest 81 days. Of the first groups, in which there were 226 pigs, 122 were vaccinated and 104 left as controls. They comprised 37 litters and averaged 15% inbreeding—65 of the pigs were males, 57 females.

Out of the 122 pigs which were vaccinated, 112 had good takes and 10 had no takes. There were 31 cases of swine pox in the entire group of 226 pigs. Fifteen of the pigs which had pox had been vaccinated. Ten of the 15 vaccinated pigs had good takes while the other 5 had no takes. Sixteen head of the non-vaccinated pigs had pox.

All animals, except those selected for record of performance (feeding), were to run together after weaning, which was at eight weeks of age. None of the adult swine in the experiment were affected with pox. They had had the disease the year before.

Test Litter Pigs

This group of 64 pigs included four from each of 16 litters. The pigs were representative of the litter and were fed in groups of four.

Total pigs in group	64
Number vaccinated	35
Number of "takes"	34
Number of controls	29
Takes contracted pox	4 = 12%
Controls contracted pox	11 = 38%

Tentative Conclusions

No significant differences were noted between the vaccinated and non-vaccinated pigs. There were, however, more cases of pox and mange in the non-vaccinated pigs.

If comparison is made between the fall pigs of 1942 and the spring pigs of 1943, swine pox and mange were much more severe among the fall group. None of the fall pigs were vaccinated. The severity of the fall outbreak may have been increased by the pigs piling up more during cold weather. The spread of the disease among the spring pigs was far more rapid than in the fall.

While the records do not show significant differences, observations indicate that the vaccinations lessened the severity of the pox and maybe prevented some of the more serious complications.

Other Reasons for the Experiment

While pox does not occasion high mortality, it is very important economically. Affected swine lose flesh and do not gain in weight. The disease is often mistaken for mange and the animals treated accordingly, which further impedes their growth.

We have observed sows nursing their first litter of pigs with their mammary glands covered with pox lesions. Proper nursing by the young is impossible under such conditions because of the pain it causes. Sows

*Published by permission of the Director of Oklahoma Agricultural Experiment Station.

affected in this manner usually give very little milk and soon dry up.

Vaccination of Pigs for Hog Cholera While Affected with Swine Pox

One litter (R L 701) of five pigs was given serum and virus October 22nd. All had pox at the time and all died during December. They were 25% inbred.

A second litter (L 161) of four pigs was vaccinated against cholera November 14th. These were inbred and all died between November 22nd and December 3rd.

A third litter (L 171) of seven pigs was vaccinated November 14th and began dying in December. Five died and two were destroyed because they were not doing well.

A fourth litter (R L 711) of six pigs was vaccinated October 22nd. Two of these pigs died in December.

A fifth litter (R L 721) of ten pigs was vaccinated November 14th. Seven of these pigs died in January.

The death of the pigs in these five litters was attributed to the combined effect of the two viruses. But for the anti-hog cholera vaccination they would probably have recovered from the pox. But for the pox they would undoubtedly have survived the vaccination against cholera. Both viruses at once were too much for them.

Skin Lesions

The majority of the lesions observed, occurred on the abdomen, particularly in the region of the inner surface of the hind legs. In advanced cases the lesions extended well up on the sides. The nose, ears, back and tail were rarely affected and, when they were, we thought the extension was caused by secondary infection from scratching. The various stages of development in the skin—reddening, vesicles and pustules—described by many workers were not observed, although we constantly watched for them. We recognized, clinically, only the pustular stage, as it is usually seen by the practicing veterinarian. Many of these lesions coalesced, forming large, scablike areas up to two inches in diameter. Some animals rubbed off the scabs leaving raw areas of considerable size.

Intestinal Lesions

Some swine did not develop the skin lesions but did develop what we suspected was a visceral form of the disease. Such pigs first manifested a severe diarrhea, became

As with vaccination for hog cholera the pig should be held by the hind legs with the abdomen toward the operator—even the pet pigs of "Future Farmers" wives

gaunt, went off feed and usually died. The animals thus affected, that did recover, were of no economical value. On post-mortem examination these animals showed a catarrhal gastritis and enteritis. Ulcers on the gastric mucosa were not uncommon and, when they occurred, were extremely red with serrated edges. The intestinal ulcers were not of the "button" type but were smaller—sometimes bead-like. Hog cholera could be eliminated in this experimental group as the animals had been immunized with hog cholera serum and virus, at least three weeks prior to the start of the experiment. The usual enteritis manifestations common in swine had not been present in this herd due to stringent, sanitary precautions having been taken.

Preparation of the Vaccine

The scabs containing the virus were procured from an acute case of swine pox. This animal was approximately six months of age and was immune to hog cholera. After washing the area with ether to remove the fat and débris, the scabs were removed with a sharp scalpel, placed in a sterile

glass receptacle and immediately frozen and dehydrated. The virus was held in the dry state for four months in the ice compartment of an electric refrigerator. Sufficient virus was added to 50% buffered glycerine solution to make a 10% emulsion.

Method of Pox Vaccination

The pigs were held by the hind legs with the abdomen toward the operator. The skin in the fold of the flank was cleaned with ether only. After allowing time for evaporation, an area about one-fourth inch square was scarified by means of a dulled hypodermic needle. Scratches were made only in the superficial layers of the skin; not deep enough to draw blood. At no time during the procedure did the scarified area bleed. Then, with a stiff hair brush, the vaccine was applied and the pig released.

Observation

The first observation of the vaccinated pigs was made on the fifth day. Rarely was a "take" shown at this time. The area showed only redness and the scratch marks.

The second observation was made on the tenth day, at which time there was some increased redness with what appeared to be the formation of a blister. On the 15th day the "take" was well formed and appeared not unlike a take seen in man following small pox vaccination. As a rule they were well circumscribed, elevated and dull in appearance. None of the "takes" manifested what might be considered pus, even though the area had plenty of chance for soil contamination.

Summary and Conclusions

1. Swine pox appeared in this herd when the pigs were 26 days of age.
2. There was no indication that the vaccinated pigs spread the disease to unvaccinated pigs running in the same pasture and sleeping in the same quarters. From our limited observation, swine pox appears to be a family characteristic in some litters.
3. Perhaps any biting insect may be a disseminator of the virus of swine pox.
4. We have observed swine suffering from pox which were apparently free of the hog louse.
5. It is evident that not all pigs in the same litter develop pox.
6. New animals not over one year of age, if introduced into an infected herd usually contract the disease.
7. Vaccinated swine should be observed for "takes" at weekly intervals.
8. Nearly 9% of the pigs with "takes" developed pox. These may have been in the period of incubation at the time of vaccination.

Veterinary Practice by Appointment*

By M. A. Northrup
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THE progress of animal medicine during the last few decades has been a source of gratification to veterinarians as well as to their clients. Today's client expects more from his veterinarian than did those of a few years ago. We veterinarians are happy to be able to render a more accurate diagnosis, administer better medical and surgical treatment and give more scientific information on feeding and husbandry than were earlier members of our profession. However, progress is not without its penalties. Regardless of how fine a house we build we have to keep it clean or it will look worse than the log cabin of our ancestors. A fine, modern hospital will get a run-down-at-the-heel appearance, if proper maintenance is neglected.

The need for maintenance of our veterinary education; regardless of where we obtained it, must receive constant additions or we have outlived our usefulness. What is more pathetic than a has-been who is not aware of his shortcomings? Adequate maintenance of a modern veterinary education is such a prodigious task that few of us give it the attention it deserves. In order to digest, evaluate, and classify the hundreds of pages of current medical and allied literature that is available requires much time of the veterinarian and is a thoroughly enjoyable duty.

In addition to the pleasant social contacts made at our professional meetings, much valuable first hand information is obtainable. Away from the stress of practice, we are able to better evaluate our methods and see shortcomings that may account for failures. I have been in practice for more than ten years, and have never attended an A.V.M.A. Meeting. That is a neglect of duty for which I have no legitimate alibi. It has been said than an education is the best investment for a young person because no one can take it away. Maybe no person can, but neglect for even a few years can make a quack out of the erstwhile possessor of a good medical education.

Medical progress has, in most instances, increased the demands upon the veterinarian's time in order to care for his patients. We have no trained corps of assistants comparable to registered nurses and interns, nor can we readily secure the assistance of laboratory technicians and technologists on our routine cases. There are no specialists in veterinary medicine in the sense that there are in human medicine. For example, a general surgeon does not do a tonsillectomy. He believes an audio-rhinolaryngologist can do a better job. Most of us, even the self-styled specialists, have received little more than the minimum educational requirements demanded at the time of our graduation. One can hardly specialize on the entire body of any single species of animal. Paradoxically though, every town of any importance has a dog and cat specialist all done up in one individual. Most of us, no matter what we pretend to be are general practitioners who, more or less, limit our practice to conform to local conditions. To make even a reasonable attempt at keeping up with all phases of medicine, as we must or should, requires a vast amount of time and effort.

It is obviously impossible to increase the number of hours in a day. Much time is necessary to keep within even shouting distance of the results obtained by our research workers. Most of us devote insufficient time to extra-curricular activities to insure the maintenance of our physical and mental best. Obviously then, any method to increase the amount of work well done, in a given unit of time expended, should be welcome. Formerly our efforts to organize work and budget time were of no avail because we let clients come in at any time just as in the barber shop or the shoe-shine parlor. Our clients used to have no more regard for a veterinarian's time, than some women have for the time of a millinery sales lady.

*Presented at the California Veterinary Conference, San Luis Obispo, January 4-6, 1944.

In earlier days in our practice, possible clients would wander in off the street, ask to see the veterinarian and proceed to monopolize as much as 15 minutes of his time and then decide that maybe the animal didn't need treatment anyway. Such persons were not psychologically prepared to pay for service, and sometimes were found to be without funds when required to do so. I grant that some might find it a pleasant diversion to make a gentleman out of such a person, but force and violence do not usually add to the dignity, nor a respect for a profession. Or the client may be a woman who finds herself without funds—and she didn't think we would charge for examining an animal anyway. The chiropractors and some dentists give free examinations; why shouldn't the veterinarian? Abraham Lincoln once said: "A lawyer's stock-in-trade is his time and advice." The same should apply to the veterinarian and other professional men of comparable training. If a client does not like the service rendered by a veterinarian, it is his obligation to settle the account and his privilege to seek veterinary service elsewhere. We could be of mutual benefit, if all veterinarians would make an effort to see that no case that has been under the care of another veterinarian is accepted until it has been properly discharged.

Most veterinarians practice in connection with privately owned hospitals and we find we usually maintain longer office hours than physicians who usually spend their mornings in from one to several hospitals located away from their offices.

"By Appointment Only" appears on the office doors of many successful and respected physicians. It occurred to me that this might be the answer to a most difficult problem and it has worked better than I expected. My colleagues have received a number of clients that would not have come their way had I continued to practice with the "don't let anything get out the front door policy." On the other hand, many benefits have accrued that were totally unexpected as a result of the adoption of this policy.

Doctor McInnes (San Francisco) has said that one can educate his clients to do anything that is within reason. In our experience, educating our clients to the seen-by-appointment-only policy was accomplished with little difficulty. If similar action had been taken by my immediate colleagues, the change would have been less costly, but the advantages gained have been well worth the cost and I'll have to get pretty hungry before I'll resort to sitting in the front office and making myself available on demand to every transient shopper.

When a client makes an appointment, he expects to pay, and no time is wasted over arguments about free examinations. When one practices on an appointment only basis, the client who comes in to pay his bill finds it difficult to badger a veterinarian into a "just check him and see how he's doing Doc" examination. "I was coming in anyway and thought you'd want to give him the once-over." There is also the client who calls for his animal and wants to see the doctor. The purpose of this personal service being to get his bill moderated or charged. There is a high incidence of breeders in this class. Others in this group are the persons who try to become a friend of the family. Appointment only policy certainly does help to weed out these undesirables. Conversely, it attracts that group of clients who have more money than time. Punctuality is definitely appreciated by people of the business world.

It has been wisely stated that familiarity breeds contempt and that an expert authority is always from a long way off. In the earlier days of my practice I made an effort to meet people. I functioned in the capacity of a doorman when the client came in. I was a salesman of the desirability of getting needed veterinary service. If I had time before another client wandered in, I would do a little work on hospital patients but always front and center if another client or, more properly, victim, stumbled in. I would see to it that I was available whenever owners called for their animals and would personally attend to their every desire using my best bedside manner. Then, at night, I did the surgery that could have been done during the day, had I been able

to organize my work by grouping my office calls and refrained from seeing verbose clients.

Our appointments are made on the half hour basis which usually gives time to treat a hospital case or two between each two out-clinic cases. If, for some reason, an appointment needs be made when the book cannot be consulted, it is made on the quarter hour and then possible conflicts are avoided. Appointments are grouped between 10:30 a.m. and 2:00 p.m. From 2:00 to 5:30 p.m. is reserved for surgery and other jobs from which I cannot or do not want to be disturbed. Evening appointments are taken between 5:30 and 6:30 p.m.—the hospital closing time. Genuine emergencies (but not client imagined emergencies) receive the promptest possible attention and are given precedence over appointments. I have never had anyone object to this practice, but actual emergencies constitute an insignificant percentage of our total practice. After 6:30 p.m., emergency service is rendered, but the minimum charge for after hour service is $5.00. This penalty stops nonessential night work. Animals are released from the hospital only in the afternoon. This practice allows each case dismissed to be thoroughly checked before being released. Many clients phone to learn if it will be all right to bring their animals in the morning and telephone in the afternoon to learn the condition of the patient and when it would be best to call for it. Many of my best clients I have never seen. A mutually satisfactory arrangement has evolved which accommodates those people who find it impossible or inconvenient to make an appointment during the day. The client brings the animal on his way to work and leaves it along with the history of the case. On his way home, he picks up the patient if it is ready to be discharged.

Some veterinarians have adopted the policy of having their employees do much of the work on the animals such as administration of medicines and topical applications in dermatological cases and scaling teeth. I grant that many of these routine treatments can be done well by lay associates, but by following this practice the veterinarian loses contact with his patients to an extent that he is less able to keep track of the animal's condition and also the result of various forms of therapy. While his assistants do the work for which the veterinarian was trained, the latter often wastes his time pecking on a typewriter which he has never taken the trouble to learn to operate and doing other office work that could be done better by a business college graduate.

Practice by appointment makes it possible to do more work in shorter hours and fewer days. I find I do more and better work under this system, can close earlier and take Thursdays, Sundays and Holidays off. This system also makes it easier to get away for professional reasons—such as this meeting. During our absence, fewer of our clients go to that group of veterinarians who are more interested in the accumulation of large bank accounts than in becoming better practitioners. Probably all of us have forgotten the day or the hour that our return visit to the dentist is due. This seems to happen only when the appointment is made a week or two in advance. A good way to avoid this difficulty is to give the client a card with this information on it.

It was more than four years ago, that we began encouraging the making of appointments to avoid disappointments. But only for the last year and a half has it been a practical impossibility to get veterinary work done at our hospital, unless an appointment was made, or the animal left to be treated at our convenience.

Inasmuch as I have stated what a time saving and satisfactory arrangement practice "by appointment only" has proved to be, I might mention some other plans that were tried but were unsuccessful. I used to resent the time spent talking on the telephone when I should have been doing my laboratory work or a thousand and one other things that needed doing around the place. Having never been able to help a patient by talking on the phone, I resolved to discontinue it entirely. "Doctor Northrup didn't talk on the telephone." Did people get mad? We lost a goodly number of fine clients on that deal. It was a swell idea but it didn't work. As a measure of self-defense,

each of my associates routinely state that "Doctor Northrup is busy" (and that usually is true), but that he, the assistant, would take the message. Nearly always the client states his wish and is given the desired information and everyone is happy. Another thing that is instilled into the mind of the client is that if he hears from Doctor Northrup, it is bad news. However, if the client desires a personal completed report on the condition of his animal, an effort is made to see that he gets it. The adoption of these policies has resulted in a negligible amount of time wasted on phone calls.

Another highly unsuccessful and costly plan was as follows: I didn't take my usual summer vacation and was getting tired. Besides there was some repair work around the hospital that I wanted to do. I conceived the idea that I could reduce my practice to the desired minimum by doing surgery only until Nov. 1st. When my clients found out that I was in town and wouldn't treat their animals, they became more angry even than when I wouldn't talk on the phone. Several good clients found new veterinarians, and some say that their faith in me has been irreparably shattered. I have learned that I can only safely refuse work by being busy, sick, out-of-town, or dead.

As for calls, I do not make them in cases of small animals. I have always felt that they were a waste of my time and the client's money. But in refusing to take calls, I have often thought I have missed much. I am reminded of an eminently successful veterinarian who was called to a certain number on a certain street to treat a cat with dermatitis. While the veterinarian was performing his duty, the place was raided. A number of beautiful young females—well at any rate females—were arrested and the wagon called. When the veterinarian explained his situation to the officers they said, "Well, that is certainly a new one" and took him along. Fortunately he and the judge had been school-mates and it ended a delightful anecdote.

I have no desire to leave my name inscribed on impressive monolithic institutional buildings that have been erected by the funds amassed by an extensive and lucrative practice. My greatest pleasure comes from knowing that each job undertaken was done as well as circumstances would permit.

Seeing clients, by appointment only, allows more uninterrupted time for that work which we were trained to do and from which we should derive the most satisfaction. Our experience with the appointment only policy has convinced us that veterinarians would benefit both in their professional and personal lives if this policy came into general use.

Formerly I functioned in the capacity of a doorman and a salesman and attended to every desire using my best bedside manner with the patients and the owners — practice by appointment has changed all that

Most clients are pleased when we show respect for their time by rendering prompt service. This can be done without neglecting our hospital cases or our family obligations, if we plan our client conferences, at mutually convenient, specified times. The public esteem for our profession will be enhanced by the adoption of policies that would indicate our time is worth more than the shoe-shine boy who accosts his customers with the familiar "Shine, Mister, only a nickel." A "drop everything, always available" policy breeds shoppers rather than responsible clients. A "glad to consider your case when I can give it my undivided attention" attitude will create public confidence in our profession to which greater value and dignity has been added.

A New Treatment for Scabies in a Dog

By J. LaVERE DAVIDSON, Major, V.C.,
Sioux Falls Army Air Field
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THE search for an effective nonirritant parasiticide for the treatment of scabies, which has been going on in recent years, has been rewarded by the discovery of important and previously unrecognized properties of an old drug, benzyl benzoate.* This writer has used this drug with very good results in the treatment of scabies in small animals but, as yet, has had no opportunity to use it in large animals. From the results obtained in small animals it is reasonable to assume that equally satisfactory results may be expected when it is used in the treatment of scabies in the larger animals.

Sarcoptic scabies, or itch, is one of the skin diseases encountered in small animal practice. It is caused by the itch mite, *Sarcoptes scabiei* var. *canis*, which burrows into and under the skin, producing a multiform eruption and intense itching. It is highly contagious and especially trouble-

Scabies is not a self-limiting disease — treatment is always indicated

some in large kennels, pet shops and certain boarding kennels, where large numbers of dogs are crowded together in cramped and unsanitary conditions. However, simple body contact may suffice to transmit the disease.

Due to the contagious nature of scabies, rigid adherence to the plan and details of treatment is essential. Every precaution must be taken to make sure that all infected parts of the body are reached by the treatment. Of equal importance are measures instituted to prevent re-infection. The kennels, bedding, etc., should be disinfected or replaced.

Since scabies is not a self-limiting disease, prompt treatment is always indicated. Severe itching, so characteristic of this condition, usually leads to violent scratching which is very likely to superimpose a secondary infection on the existing parasitic ailment. The treatment of such secondary infections with sulfathiazole ointment 5%, or tincture of mercresin may constitute the first problem in therapy.

Sulfur Treatment Unsatisfactory

Sulfur has been used for generations in the treatment of scabies. One of the preparations most commonly employed at the present time is a 5% suspension of flowers of sulfur in an ointment base, or the application of a lime and sulfur dip. The use of this old remedy, while orthodox and more or less a habit with many veterinarians (and also physicians) is far from satisfactory. As pointed out by many observers, it frequently fails to kill sarcoptes even after diligent application. Moreover, even though it is comparatively unreliable it produces a fairly high incidence of sulfur dermatitis. Most objectionable, however, is the fact that the application of sulfur products to small animals is messy, smelly, and time consuming.

Benzyl Benzoate

The employment of benzyl benzoate by this writer represented an effort to get away from sulfur altogether and we believe it is a distinct advance over other methods of treating scabies in small animals.

Benzyl benzoate ($C_6H_5{\cdot}CO{\cdot}O{\cdot}CH_2{\cdot}C_6H_5$) is a colorless, oily liquid having a faint but not unpleasant odor and a disagreeable, sharp taste. It is freely soluble in alcohol and in fat solvents. It has a very low toxicity, being rapidly converted into hippuric

*Sarcoptic Mange in a Dog Treated with Benzyl Benzoate, *Vet. Med.* 38:12, p. 496; 1943.

acid and excreted as such in the urine. Applied locally to inflamed areas of the skin it may produce a momentary burning sensation. In the writer's experience, a solution of approximately 33% benzyl benzoate in an aqueous vehicle containing 51% alcohol (cetyl alcohol, acetone, trithanolamine stearate and distilled water comprise the inert ingredients, which approximate 16% W/V) exerted a definite acaricide action in dogs.

Method of Applying Treatment

In cases of generalized sarcoptic mange, or scabies, it is necessary to clip the entire body. If the lesions are limited in location it is necessary to clip only the regions so affected. The animal is then washed with soft soap, rubbing affected areas especially well. After rinsing but without drying and while the skin is still moist, make the first application of the preparation. A small brush or swab of cotton may be used for this purpose. If the condition is generalized the solution is applied to the entire body, otherwise only those areas affected. The first application is allowed to dry and then a second application is applied. The skin is then allowed to dry without rubbing. The following day the patient is bathed with a neutral soap.

If itching continues after a day or two, there may be (1) a slight irritation from the treatment which will disappear soon or (2) some of the acari may have escaped destruction. It is well to allow at least a week to elapse before repeating the treatment. It has been necessary in only a very few cases to repeat the treatment.

Advantages of Treatment With Benzyl Benzoate

This type of treatment has a number of advantages to the patient, the owner and to the veterinarian. The patient is ambulant throughout the period of treatment and is subject to a minimum of inconvenience and discomfort no matter how severe the infection. The owner and the veterinarian are not subjected to the messiness of sulfur dip or the sulfur smell. The acaricidal action of benzyl benzoate is immediate and reliable and no post-therapeutic irritation of the skin results. Pyodermatitis, due to secondarily infected scabies, can be thoroughly treated and rapidly cured. The whole treatment as far as the application to the skin is concerned can be completed in 30 minutes and at a small cost.

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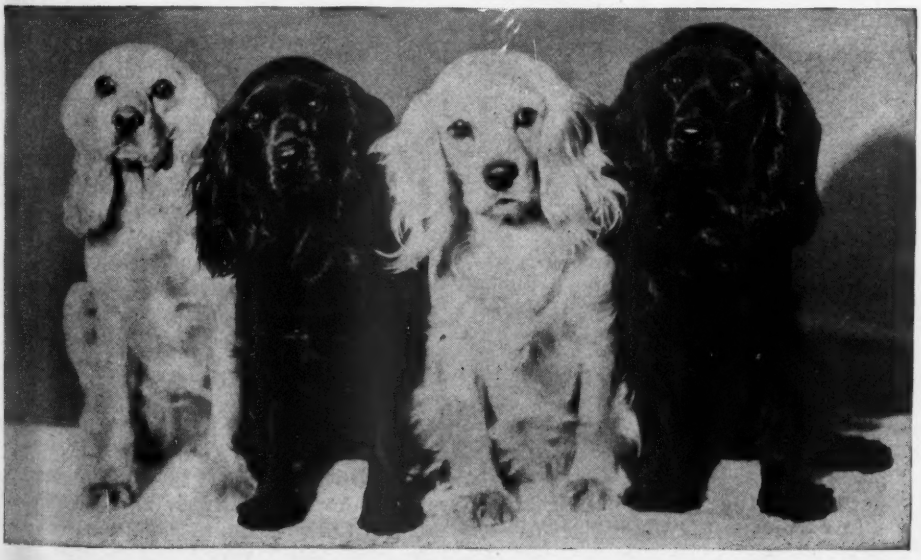

Clinical Reports

Ileal Volvulus in a Horse

Intestinal torsion in equines has been uncommon in this vicinity recently. Nevertheless a case was encountered last spring which seems of sufficient interest to report.

A summons came at 9:30 p.m. for what was described as of a "Colic Nature." On my arrival, the patient—a dark brown, part thoroughbred horse about fifteen years of age—showed symptoms of intense, regular pain and was extremely uneasy. Upon questioning, the owner admitted administering one quart of raw linseed oil and some turpentine at 7 p.m. when the first symptoms of colic were noted, following a hard day's work ploughing in a stony field. He also added that the horse had not seemed just right all afternoon.

Examination revealed slightly congested conjunctival mucosa, pulse 52, labored, frequent breathing and perspiration in the flanks. The horse would occasionally turn his nose to the right flank, then walk a bit, then roll, then rise and defecate a small amount, and then eat some hay which created more peristalsis and recurrence of the above cycle of symptoms. Because of the sandy land in this community, the possibility of "sand impactions" should always be considered as they are quite prevalent in the pelvic flexure, especially in the late autumn when animals are pasturing on recently seeded green rye of the tobacco fields. Cecal impaction, therefore, was my first thought and I administered 2cc of lentin hypodermically, and one Reek's capsule (nux vomica and ammonium carbonate). There was bowel evacuation, followed shortly by relief from pain.

However, the pain returned more violently than ever about half an hour later. The pulse increased and was quite irregular, the temperature gradually fell from 102.5 to 100° F. This time, in addition to the symptoms mentioned, the horse would sit on his left rump and thigh and brace himself up with his forelegs, nose to right flank.

A torsion of the bowel in the right abdominal region was suspected as the "dog sitting" symptom of a college lecture came to mind.

A rectal examination was made with little satisfaction as to the location of the twist. However, a diagnosis of "Torsion" or "Gut-tie" was made and chloral hydrate, to be given in two dram doses every hour, was left with the owner.

Needless to say the prognosis was absolutely bad. At midnight a final check-up of symptoms was made—pulse 82, highly congested conjunctival mucosa, severe dypnea, sweating, absence of peristalsis and bowel evacuation, patient listless and in a continual dog-sitting position.

Death occurred in the early morning. Post-mortem examination revealed a volvulus of the ileum anteriorly. Parts immediately distal to the constriction were gangrenous and distended with a dark reddish colored fluid. Altogether it was a very interesting but pathetic case to observe.

W. B. DURRELL

Simcoe, Canada

* * * *

Bovine Cussedness

One cold night in January, on a call to see a sick cow, I found her in a recumbent position. I was unable to diagnose the ailment, as there seemed to be no abnormal condition. She ate and drank when food and water was offered her and did not seem to be in any pain. After considerable exertion on my part and profanity on the part of the owner, we rigged up a block and line. However, when we raised her up she refused to put any weight on her feet, so we placed some straw under her and let her down gently.

The owner by this time was exhausted and so we went to the house where it was warmer which suited me as also did his suggestion that I go to bed for the rest of the night . . . when I awoke the next morning the owner had already been to the barn and reported that the cow was lying up on the sternum and eating and seemed normal in every respect. If there was anything but cussedness wrong with this cow I have yet to learn what it was. That this trait is not confined to the female of the bovine species I learned in my younger days when

I was an ox driver in the mountains of West Virginia.

REMBRANDT MORGAN

Winfield, W. Virginia

Incontinence in a Bitch

The patient, a 2½-year-old Airedale bitch, was presented to me with the following history. The dog was purchased when six months of age and she was spayed at the kennel before being taken by the new owner. Shortly afterward the dog developed incontinence of urine of an irregular character. By the time she was one year of age the incontinence was continuous. Veterinary advice was sought by the owner from a number of sources, but the treatment was of no avail. After this had been the situation for a year and a half we made our examination. Appetite and temperature were normal, and the appearance of the external genitalia also was normal. The urine was of rather strong odor. Digital palpation failed to reveal the presence of any abnormalities.

It was decided to place the bitch on 70 grains of sulfathiazole daily for five days, as well as diethylstilbestrol in oil. After several days the odor of the urine was improved to the point that it no longer was objectionable. This likely was due to the relief of bladder inflammation by the sulfathiazole. The diethylstilbestrol was given intramuscularly in 4mg doses every 48 hours for a week with very little effect. The dose was then increased to 12mg every 48 hours, but the incontinence continued. In desperation 25mg doses were given, twice weekly, for four doses with still no marked change in urinary control.

An operation for abdominal adhesions was advised and the owner consented. The bitch was prepared aseptically and an intravenous injection of pentobarbital sodium administered. A three-inch, mid-line incision was made posterior to the umbilicus and the abdominal cavity laid open. Examination disclosed the source of the trouble. The right and left uterine horns had not been removed at the time of spaying, and had formed adhesions with one another and with the dorsal wall of the bladder. These adhesions prevented the contraction of the bladder posteriorly and consequently the bladder was distended and fixed well forward. The pressure of the retained urine was sufficient to cause a constant dripping.

The bladder wall was incised and the area of the adhesions removed. The wall of the bladder was closed with a double row of continuous Lembert sutures (No. 00 chromic catgut). The adhesions with the uterine horns were then removed at the body of the uterus after ligation. The abdominal incision was then closed with No. 2 chromic catgut and dermal suture. Recovery was prompt and the dog returned home at the end of the week.

Examination a month later showed a complete cure.

HEROLD M. HARTER, JR.

Toledo, Ohio.

Cryptorchid Calves

Recently I was called to treat three cryptorchid calves weighing from 450 to 500 pounds. All three were sired by the same bull.

The first calf examined had one testicle in the scrotum and I thought I could feel another in the region anterior to the scrotum. The calf was cast and the undescended testicle found in the area suspected and removed along with the normal organ.

On examination of the next calf no testicles could be palpated but it was cast and an incision made in the usual location for castration. A search of the region anterior to the scrotum revealed two very rudimentary testicles which were removed. Had I operated upon this calf first, I might have made an incision through the flank and searched in the abdominal cavity for testicles that weren't there. This illustrates again as I have experienced before that it is well to search along the penis anterior to the scrotum for the misplaced testicles before making an abdominal incision.

The third calf in this group of three cryptorchids was like the first one operated upon.

T. A. SIGLER

Greencastle, Ind.

Atresia Ani in a Newborn Calf

February 1, 1943, a white-faced, roan, shorthorn heifer calf, three days old, was presented for treatment. It weighed about 65 pounds.

Parturition had been normal and nothing unusual was noticed until the calf was 48 hours old. At this time it was heard gasping and straining in an apparent attempt to defecate. Upon closer scrutiny no anal opening was visible. When questioned, the owner revealed that the parents of the calf were half brother and sister. No other history of significance was obtainable.

The following symptoms were observed: normal temperature and pulse rate, respiration slightly accelerated, normal pink conjunctiva, frequent characteristic gasping and straining, followed by short bellowing. As the intra-abdominal pressure increased, a pouchlike swelling appeared in the anal area. This swelling reached about one inch in length and was about one and one-half inches in diameter at the base. There was a slight, brownish, mucous-like vaginal discharge which appeared to contain meconium, however no tract could be found joining the tubular genitalia with the digestive tract.

A diagnosis of atresia ani was made and a guarded prognosis given. Operative treatment was advised to which the owner gave his consent.

The animal was cast in lateral recumbency, and the following instruments were gathered and sterilized:

One Bard-Parker handle and blade.
Two pairs of hemostat forceps.
One full-curved, cutting-edge, suture needle.
Braided silk suture material.
One 10cc glass syringe.
A bottle of 1% solution of procaine hydrochloride.

After infiltrating the perineal region with 15cc of the procaine solution, an alcoholic sublimate pack was applied. Allowing 10 minutes for the anesthetic effect, a 2½-inch horizontal incision was made, one inch above the dorsal commissure of the vulva. Medially and perpendicular to the first incision a second was made from it extending dorsally one-half inch toward the base of the tail.

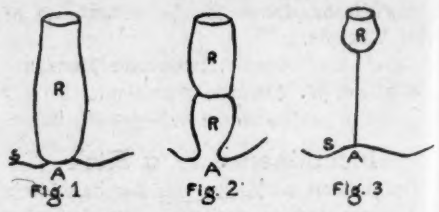

Fig. 1 Fig. 2 Fig. 3

Fig. 1. The rectum and anus are normal, but nature fails with the result that the cutaneous septum is not absorbed, resulting in occlusion. Fig. 2. A transverse membrane (3 inches from the anus) separates the posterior from the anterior part of the rectum. Fig. 3. The type described in this case in which the rectum terminates in a blind pouch a variable distance from the anus

Entering the subcutis and musculature by blunt dissection, the blind end of the rectum was located about three-fourths of an inch beneath the surface of the skin. After some dissection to isolate this gut and suitably identify it, it was punctured and the meconium was allowed to exude through the tissues. About eight ounces was discharged before the animal ceased straining. After thoroughly cleansing the area with 1% aqueous sublimate and cotton, the opening into the intestine was enlarged until it was one-half inch in diameter. The edges of the incised rectal wall were brought to the exterior and sutured in an approximate circle to the skin surrounding the incision. After suturing the superfluous primary incisions the animal was released and walked to the owner's car.

One month after the operation, the owner answered an inquiry thusly, "The calf is doing as well as any calf, in fact, she has not missed a meal."

MARSHALL P. REEVE

Garden City, Kans.

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Abstracts

The Value of Meat

In two years since Pearl Harbor, the live stock and meat industry[12] has produced a weapon of war (meat) at a rate which didn't seem possible when the job was tackled. The supplies of meat produced have broken all records. It has been sent to the battle front, consumed by civilians and billions of pounds of meat and lard have been shipped to our Allies overseas.

This great industry must be ready to cope with the problems of the post-war period. I am hopeful concerning what may happen when that time comes. The Government has not advocated "meatless days" such as we had in World War I. Then, too, our people have a better appreciation of the value of meat in the diet. At the time of the first World War, most people thought of food only as something to satisfy hunger. Food was not considered in terms of nutritional value. Today, it is quite generally known that certain elements are essential for a properly balanced meal, for the food value of meat is much better known.

Just 20 years ago, the Board's directors, sensing the need for such studies, made the first appropriation for meat research. Little was then known about meat as a source of protein, minerals and vitamins. The first research was started at the University of Rochester in New York and it has been carried on at colleges and universities —in all 17 different institutions in 10 states. In addition many of the large meat packing industries have instituted research laboratories. These studies have meant much for they have shown the dietary need for meat and that many of the essential elements for growth and development are contained in meat. The facts discovered as a result of this research are being utilized in nutritional programs, in the Army posts and at Naval stations and in the home. The Home Economics department of the Board has received a flood of letters concerning the economical use of meat in the home.

In January, representatives of the National Livestock and Meat Board, of state agricultural experiment stations and of the U. S. Department of Agiculture held a conference at which time they drew up a program of meat research which covers a wide field. Workers in more than 20 states will participate in the proposed program—we believe it will mean much in the post-war days.

[12] Farr, Harry W., Livestock Industry Meets Demands of War, *The Sheepman*, 14:9, pp. 278-279; 1944.

* * * *

Initiation of Lactation in Heifers by Hormone Administration

Details are given of the successful initiation and maintenance of lactation in two nulliparous heifers[6] by the subcutaneous injection of stilbestrol over periods of 11 and 13 weeks respectively. Dosage consisted of 5mg diethylstilbestrol dipropionate twice weekly for six and five weeks; in the following five and eight weeks the dose injected was progressively increased from 7mg twice weekly to 20mg twice weekly. The total amounts of stilbestrol used in the two heifers were 163mg and 268 mg respectively; in the heifer receiving the smaller amount, 5mg of testosterone dipropionate was also injected twice weekly for the first six weeks. During the injection periods there was some increase in udder and teat size, but there was no distension of the udder with secretion.

Milking was commenced at or shortly after the cessation of the injections, when the secretion was similar to colostrum. Following this, both heifers suckled calves for a time. Approximately four and five months after the commencement of stilbestrol adminstration both heifers appeared to be in full milk flow. The peak daily milk production in one heifer was 27.5 pounds and in the other 33.7 pounds. One heifer conceived to service after the stilbestrol administration had stopped. The diestrous cycle in the other heifer was irregular, and she was subsequently shown to have developed a cyst in one ovary.

This report confirms the previous work of British authors (Folley, *et alia*, 1940, 1941), that the subcutaneous injection of diethyl-

[6] Reece, R. P., initiation and maintenance of lactation in dairy heifers by hormone administration. *Proc. Soc. Exp. Biol. Med.*, 52; pp. 145-146, 1943. Abst. in *Vet. Rec.*, 55:51; p. 492.

stilbestrol dipropionate will stimulate udder and teat growth and initiate and maintain lactation in nulliparous dairy heifers. The present author suggests that suckling a calf may aid in bringing about full lactation in heifers prepared for lactation by hormone administration.

Reduction of Toxicity of Sulfonamides

A report of recent date by Chamelin and Funk tells of remarkable results obtained in the reduction of the toxicity of sulfanilamide and diethystilbestrol in rats by the injection of whole liver extract. Pelner[6] commenting on this report in the light of his own experiments believes that the ameliorating action of this whole liver extract is due to its high ascorbic acid content. It has long been known that, next to the adrenal glands, the liver contains more ascorbic acid than any other animal tissue.

Minimum Dose of Phenothiazine for Sheep

Gordon[7] notes that most workers who have tested phenothiazine as an anthelmintic for sheep have recorded its high degree of efficiency against *Haemonchus contortus* and that there is little doubt that the full dose, 20 to 25gm for a grown sheep, will always remove all the adult females of this parasite. He adds that such a large dose is expensive, costing about 4d. per sheep at the present price of phenothiazine in Australia, and that if a smaller dose serves the same purpose the drug can be used more widely. Results from a limited number of experiments show that doses exceeding 6gm for sheep of about 30Kg body weight will almost invariably remove all *H. contortus* females. For older, heavier sheep a dose of 10gm, or half that necessary to obtain high degrees of efficiency against *Oesophagostomum columbianum* and *Trichostrongylus* spp., is likely to remove all the female *H. contortus* from the vast majority of, if not all, sheep.

[6] Pelner, Louis, 1943. Use of liver to overcome toxicity of sulfonamides. *Jnl. A. M. A.*, 123:2, pp. 113.

[7] Gordon, H. McL., the minimum dose of phenothiazine required to remove 100% of *Haemonchus contortus* from sheep, *Austral Vet Jnl.*, 19; pp. 29-30, 1943. Abst. in *Vet. Rec.*, 55:51, p. 492.

Sulfaguanidine and Sulfathiazole for Pullorum in Turkeys

Ninety turkeys, 3½ months of age, all of which were acutely ill with pullorum disease, were divided into three groups of 30 each by Bankowski.[9] Group I was given an initial dose of one-half grain of sulfathiazole and fed a mash containing 2% of the drug for seven days. Group II was given sulfaguanidine in similar dosage. Group III, the controls, was untreated. No benefit was derived from either the sulfathiazole or the sulfaguanidine. All three groups showed improvement in four days and in nine days all survivors appeared to have recovered completely. The mortality in the three groups was nine, ten and nine. The blood levels of these drugs remained very low at this dosage—averaging 8.85mg percent for the sulfaguanidine and 1.70mg percent for sulfathiazole.

Penicillin Sodium and Sulfonamides in Certain Protozoan Infections

After experiments[5] with rats and mice the department of comparative pathology and tropical medicine of Harvard University reports that penicillin sodium, even in large doses, was inactive against trypanosomiasis (*T. lewisi*) as it was also against toxoplasmosis, a comparatively new and almost invariably fatal infection caused by an intracellular protozoan. However, in the treatment of relapsing fever (*S. novyi strain*) the penicillin sodium was found to be spectacularly effective.

Also from the same department of the Harvard Schools of Medicine and Public Health comes a report[6] that, in experiments with mice and rabbits infected with toxoplasmosis, sulfonamides (particularly sulfapyridine) were strikingly successful in curing an acute attack of the disease if given quite early in the infection. The sulfonamide therapy does not sterilize the infection and the cured animals remained carriers and retained virulent organisms in the brain.

[5] Bankowski, R. A. A trial of sulfaguanidine and sulfathiazole in the treatment of acute pullorum disease in turkeys. *Cor. Vet.*, 33:3, pp. 312-314, 1943.

[6] *Science*, 99:2558, pp. 19-20, 1944.

[6] *July Am. Med. Assn.*, 124:1, pp. 6-8, 1944.

Book Reviews

Veterinary Obstetrics by *W. L. Williams*, Professor Emeritus, Cornell University. Fourth edition; 478 pages, 105 illustrations. Published by the author, Ithaca, N. Y. 1943. Price $6.50.

To Fleming (1877) and Williams (1909 *et. seq.*) credit for the presentation of the science of obstetrics in the English language is due. American writers on the subject followed closely the classic work of the former until the second edition of the present work appeared in 1931. At that time a new premise was added to the discussion. The ground was taken that dystocia is not due to the whims of chance but is a consequence of errors in animal husbandry and that many of these errors are definitely recognizable and consequently preventable. As a result of this new view and the supporting discussion this treatise and the companion volume "Diseases of the Genital Organs of Domestic Animals" by the same author have been translated into Italian and Spanish. It is certainly a distinction that two of the very small number of veterinary texts, by American authors, that have been translated into foreign languages, should be works of Prof. Williams.

This new conception of the causes of dystocia and the measures for its prevention has necessitated a more comprehensive consideration of the physiology of the generative organs than was formerly accorded to treatises on obstetrics. Embryology and teratology also take on added importance because of this concept of obstetrics, and the work under review meets well these new obligations.

The author takes a pessimistic view of the value of obstetrical operations and regards many of those which the practitioner who performs them considers successful, as being failures—from an economic viewpoint. He also deplores the fact that because of the inadequate information given, most records of dystocia cases are valueless. The economic value of a given operation can be determined only when the veterinary fees, mortality, and the cost of labor and feed till recovery, is set over against the value of the surviving dam and of the offspring. He regards breeding a dam that has suffered a reproductive catastrophe as being inadvisable, or at least a questionable practice and that, therefore, the value of the surviving dam is, in most instances, limited to her value for meat, milk for the current lactation, or for work. This of course emphasizes the importance of preventing dystocia, around which all obstetrics revolve, by proper animal husbandry practices and preventive veterinary medicine. The work embodies the wisdom derived from the author's 64 years of professional experience in practice, teaching and study of veterinary medicine. No previous writer on veterinary obstetrics has been able to tap a lode of equal extent or richness.

As in the case of previous editions of this work the current edition can be recommended with confidence.

Nutrition of the Dog, by *Clive M. McCay*, Ph.D., Professor of Nutrition, School of Nutrition, Cornell University, 140 pages, 14 illustrations. Comstock Publishing Company, Inc., Ithaca, New York, 1943. Price $1.50.

This work is intended to satisfy the needs of both the pet owner and the scientist in the matter of the practical and scientific feeding of dogs. The author draws liberally from his own large experience and the early and recent publications on physiological and nutritional studies with dogs. An excellent bibliography is provided at the end of each chapter.

In writing a book which can be used by the pet owner, who has a limited knowledge of food and its constituents and functions and, at the same time one of value to the scientist who would prefer to have a critical review of the existing knowledge of dog nutrition, the author has undertaken a difficult task. The result is but a partial satisfaction of the needs of either group. The pet owner without a scientific training will not gain, from this work, a knowledge of the fundamentals of nutrition, which is the first requisite of sound practical feeding and, at the same time, he will be confused by the unexplained discrepancies in some of the results of different scientific workers reported in the book. On the other hand, the veterinarian will have to sort out the specific from the more general information. Still more disappointing in many instances

he is not given the benefit of the author's critical comments and interpretations of scientific findings.

The following are sample statements that may confuse the reader or even mislead him:

"Over a century ago Magendie found that dogs could [can] be kept alive for long periods

upon fresh bones; but if the bones were [be] boiled the dogs died [die] within a couple of months."

There is nothing in the context to explain this result.

In discussing the inadequacy of a carbohydrate diet (p. 7) it is stated: "Such a diet lacks vitamins, proteins and minerals. Likewise, if a dog is fed largely upon potatoes with a little meat it will break down from both vitamin and mineral needs." From this the lay reader might readily infer that the meat does not improve the mineral and vitamin intake.

The composition of a popular dog food is given (p. 87) and the author suggests what he terms a "simpler mixture" as a substitute. The former includes 14 ingredients, the latter 13 (including two types of yeast). The reviewer is unable to discern why it is "simpler."

"Mistakes of manufacturers" are listed but no way of avoiding them is indicated. Nowhere is the manufacturer told how to judge the quality of the ingredients he uses in his dog food. There seems to be an implied criticism of dog foods on the ground of low fat content but no statement of what the fat content should be (p. 92).

A cost breakdown is given for canned foods but not for dry foods. It appears to be a criticism of the former on the ground of expense but no comparison can be made by the reader because of this omission.

There will be general agreement with the statement " . . . little control has been exercised. The veterinary service of the U. S. Food and Drug Administration has remained asleep, much to the injury of the ethical feed manufacturer and the consumer. The veterinarian has been in a quandary. He also has had no guidance." However, a word of praise might have been given the Federal Trade Commission for its very considerable achievements with limited authority.

The procedure described for "Metabolism Studies" will seem crude to the scientist. The layman will find it lacking in concise directions and in details.

The discussion of vitamins is not up to the standard attained generally in the work. The reader may infer that dogs do not suffer from vitamin C deficiency, because of repeated statements that this animal can elaborate vitamin C. He should have explained that healthy dogs can manufacture this vitamin when the diet contains the necessary ingredients from which to make it. He twice mentions that vitamins A and B are destroyed to the extent of 10 to 30% in baking dog biscuits but does not mention that some manufacturers use ovens that destroy little of these vitamins while others use types of ovens that destroy practically all of the thiamine.

On the whole the author has made an excellent start with "Nutrition of the Dog." In future editions, faults, such as those mentioned in the foregoing, can be eliminated with comparatively little effort.

You may obtain any book reviewed in this department by remitting the published price to the Book Department of VETERINARY MEDICINE, 7632 S. Crandon Ave., Chicago, Ill. Bulletins and circulars may be obtained free direct from the State Experiment Station issuing them. Government bulletins from the Superintendent of Documents, Washington, D. C.

Useful Bulletins, Circulars, Etc.

Mastitis. — Infectious Bovine Mastitis Bul. 240, University of Connecticut, Storrs.

Goats.—Purina Goat Book, Purina Mills, St. Louis, Mo.

Milk Goats.—U. S. Dept. of Agri. Farmers Bulletin No. 920.

Poultry.—Directions for Drawing Blood Samples for Pullorum Disease Serum Agglutination Test. Oregon State College, Corvallis.

Livestock Marketing.—Wartime Waste in Marketing Livestock, Report of National Livestock Loss Prevention Board, 700 Livestock Exchange Bldg., U. S. Yards, Chicago.